

Supplement to
Form 21325
Machine 221
(566)

SERVICE MANUAL

SINGER*

MACHINE 221

THE SINGER COMPANY

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Printed in U. S. A.

DESCRIPTION

Lightweight portable lockstitch machine with reversible drop feed and electric drive.

Graduated stitch length indicator.

Numerically graduated thread tension device.

Rotary hook on horizontal axis, makes two revolutions per stitch.

Machine 221K7 is equipped with belt linkage between arm and hook shafts. Other varieties are equipped with an upright arm shaft and gears.

Hinged bed extension.

Manually controlled bobbin winder attached to belt guard.

Needle, Cat. 2020 (15x1), threaded from right to left.

The motor is mounted on machine bed. Wiring to motor and light is concealed in machine arm and bed. The machine is equipped with a foot controller. (Note: Machine 221K4 is also equipped with R. F. Suppressors and grounded wiring.)

Light and light shade attached to front of machine arm with control switch located on bed. (Machine 221K4 has light switch built into the light socket.)

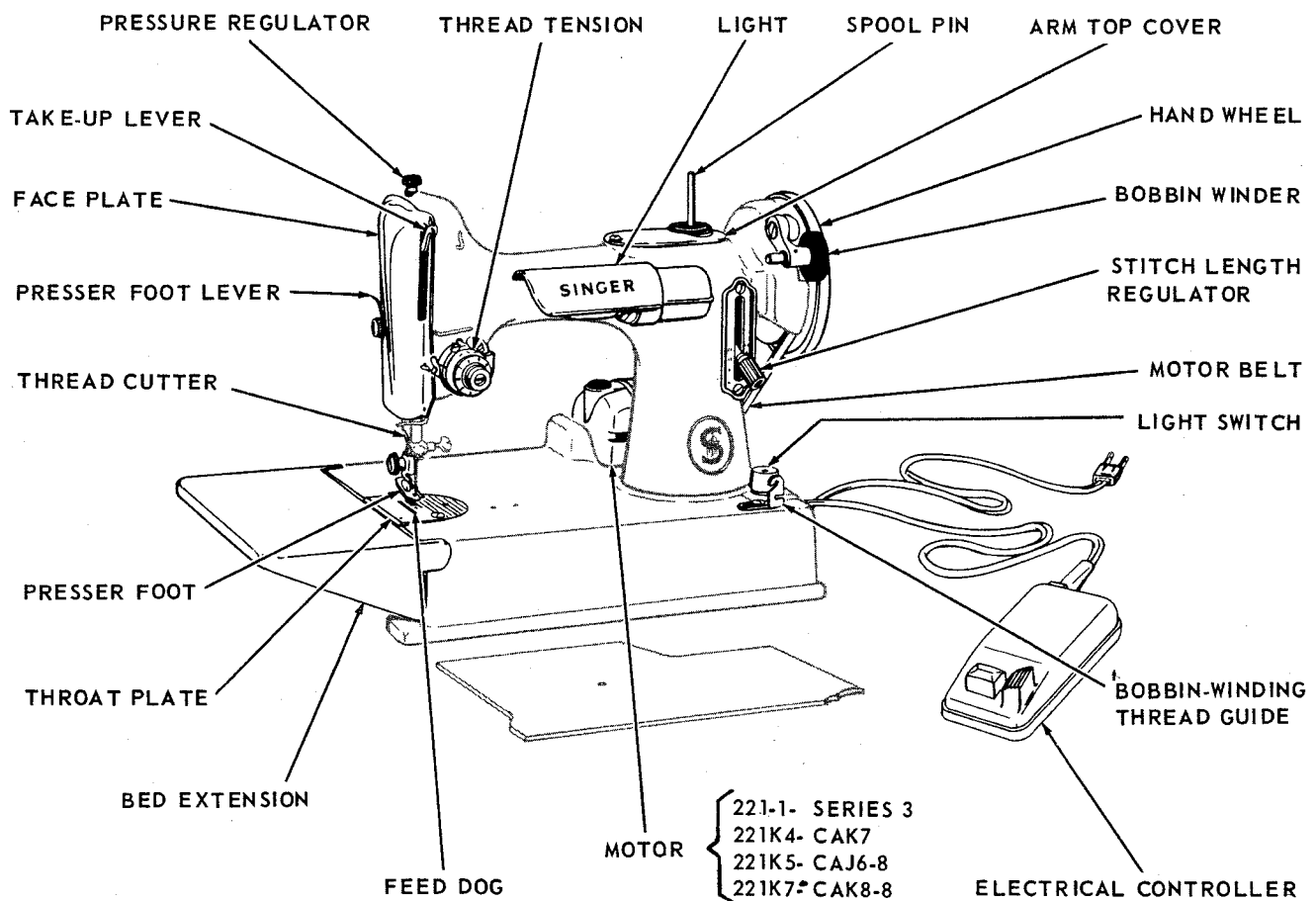
Machine base 10-7/64 inches long, 7-1/4 inches wide. Space at right of needle, 5 inches.

Presser bar light: 5/16 inch. Feed dog height: .040 inch above throat plate.

Maximum stitch length: 6 stitches per inch.

Speed range: 900 to 1400 r. p. m.

PRINCIPAL PARTS AND FEATURES



PREPARATION FOR INSPECTION

Before inspection to find causes of faulty operation, the machine should be thoroughly cleaned and lubricated.

Remove face plate and throat plate. Open arm top cover and remove bottom cover.

Remove lint and other foreign matter that may have accumulated around the sewing area and clean all exposed moving parts with a broom type nylon brush dipped in varsol.

CAUTION: KEEP VARSOL AWAY FROM ALL RUBBER PARTS.

Note: Under extreme conditions (if grease and dirt is hard and tacky) remove motor, light and wiring, as instructed on page 25, and soak machine in a tank of varsol until solids have become softened.

CAUTION: Before dipping Machine 221K7 in varsol, it will be necessary to remove the Arm Shaft Connection Belt, as instructed on page 24.

LUBRICATION

Use **SINGER* OIL** and **SINGER* LUBRICANT**.

With the face plate removed and arm top cover removed or turned aside, apply a small amount of oil or lubricant to each of the points indicated in Figs. 3, 4 and 5. Close arm top cover and replace face plate.

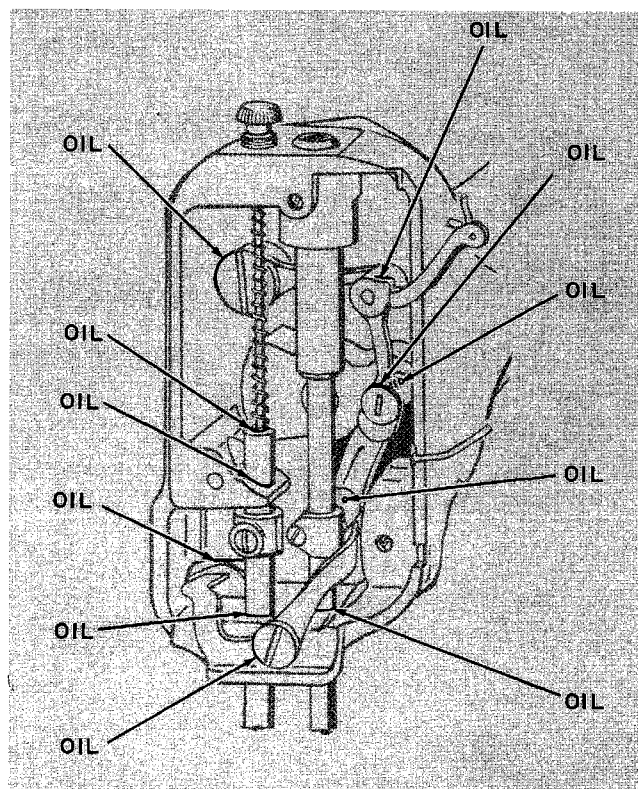


Fig. 3. Lubrication - Inside Face Plate

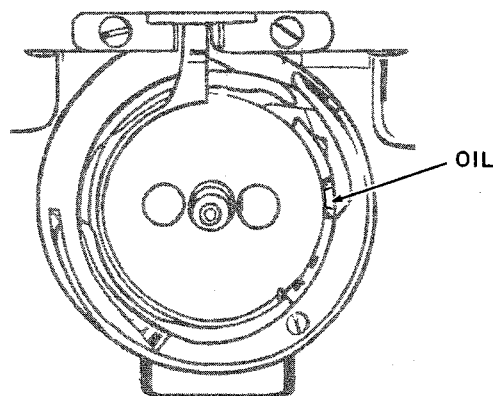


Fig. 4. Lubrication of Hook

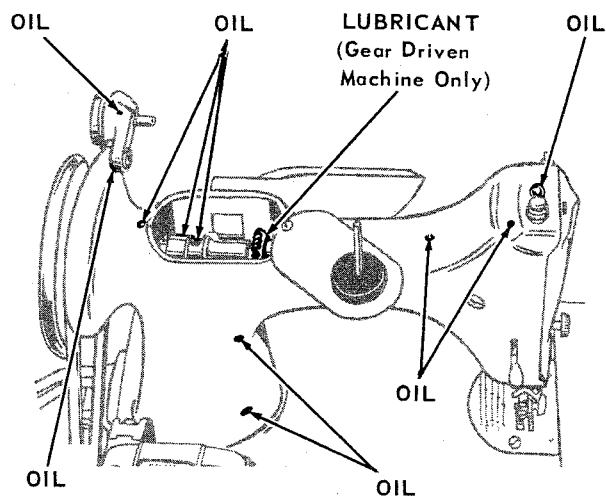


Fig. 5. Lubrication - Rear and Top

Turn machine on its side, remove bottom cover and apply oil or lubricant to each of the points in-

dicated in Fig. 6. Replace bottom cover.

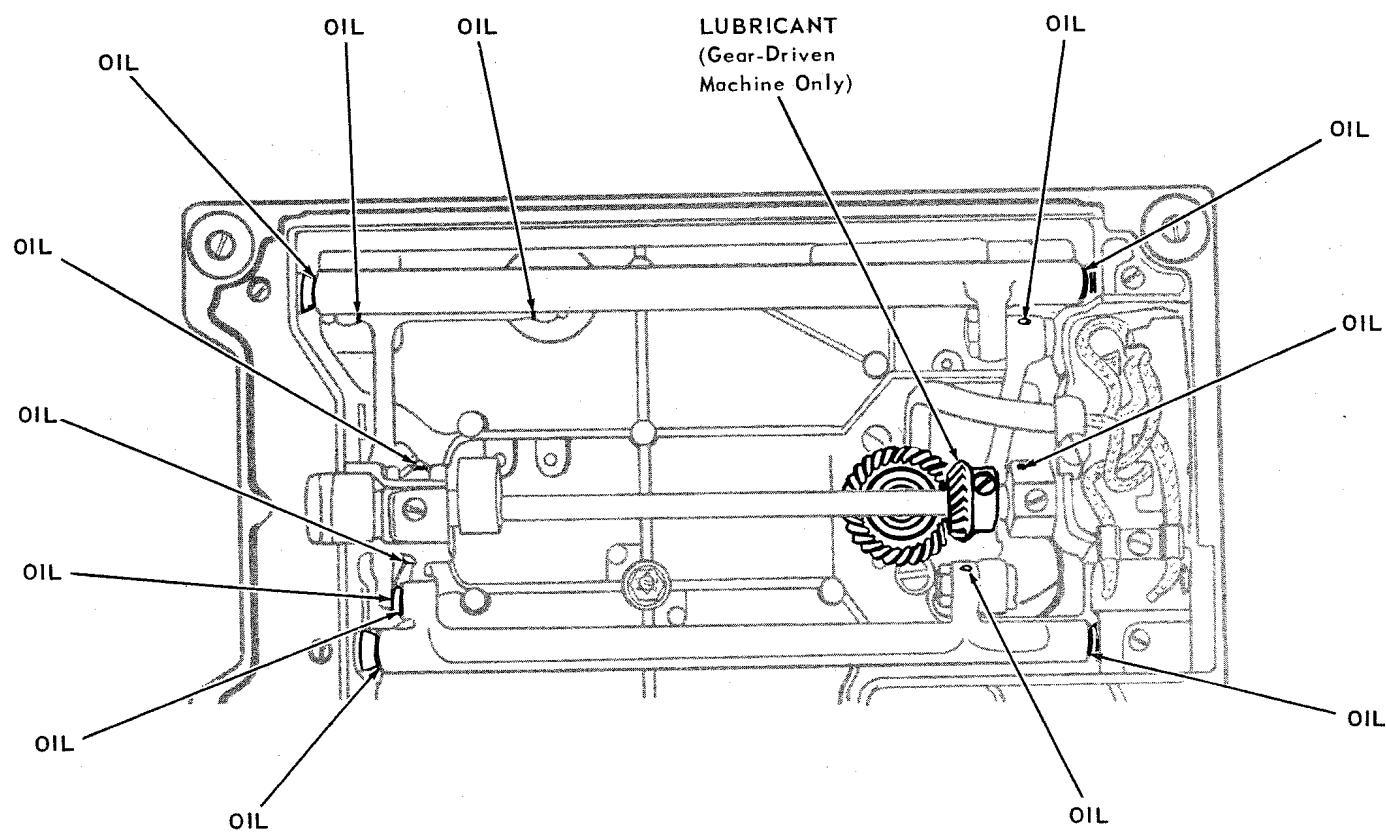


Fig. 6. Lubrication - Machine Bed

TO LUBRICATE THE MOTOR

Never use oil or ordinary gear grease to lubricate motor. Entrance of oil into motor may cause failure of electrical components. Use **MOTOR LUBRICANT** sold by The Singer Company.

The two motor grease tubes, Fig. 7, should be refilled every 6 to 12 months, depending on machine usage.

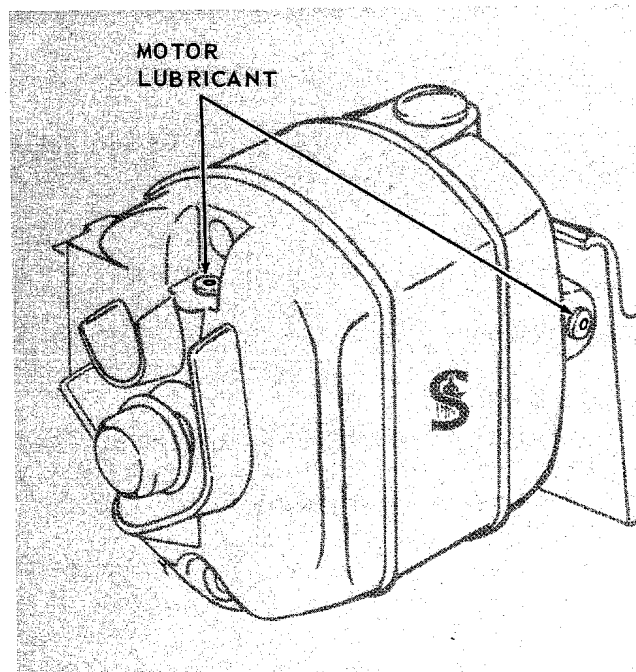


Fig. 7. Lubrication - Motor

TO SET THE PRESSER FOOT HEIGHT

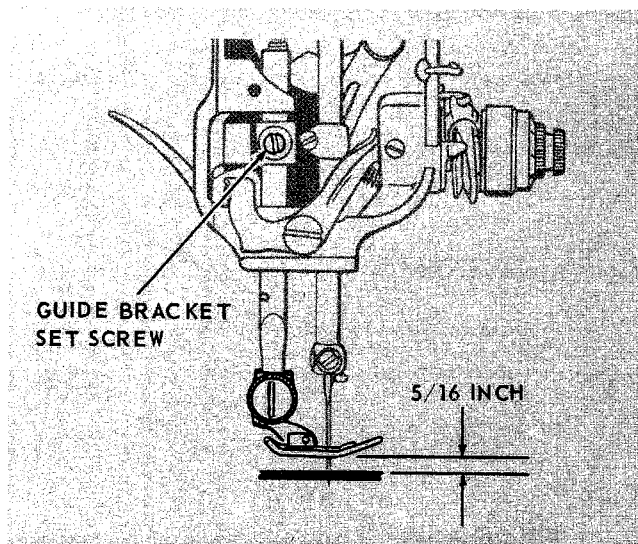


Fig. 8. Setting Presser Foot Height

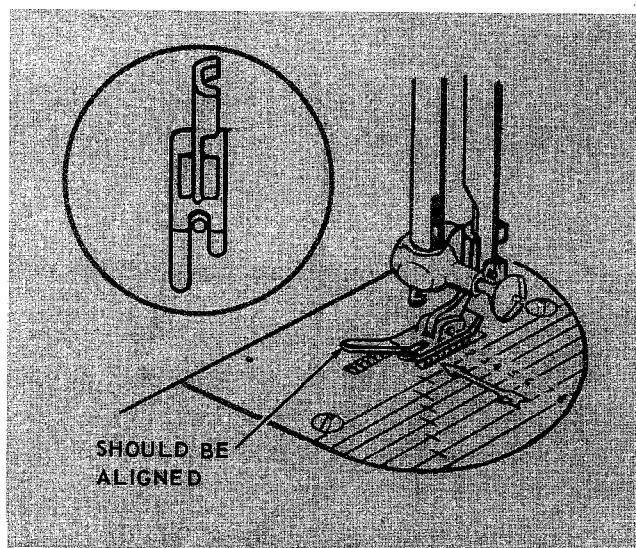


Fig. 9. Aligning Presser Foot

CHECK:

When presser foot is raised to highest point, distance between bottom of presser foot and top surface of throat plate should be 5/16 inch, as shown in Fig. 8. (Note: The needle clamp, when at its lowest point, should not strike the raised presser foot.)

Presser foot should be in alignment with throat plate slots and feed dog, as shown in Fig. 9. Inset, Fig. 9, shows correct alignment of presser foot with needle.

SETTING:

Loosen, guide bracket set screw shown in Fig. 8 and raise or lower presser bar as required to obtain correct height.

Align presser foot with throat plate slots and needle as shown in Fig. 9.

Securely tighten guide bracket set screw.

TO SET THE FEED DOG HEIGHT

PREPARATION:

1. Remove bottom cover.
2. Set stitch length regulator for 12 to 15 stitches per inch.
3. Turn hand wheel toward operator until feed dog is in its highest position.

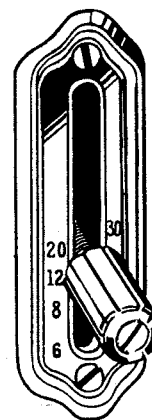


Fig. 10. Preparation - Feed Dog Height

CHECK:

With feed dog at highest point, approximately the full depth of rear teeth should project above top surface of throat plate.

SETTING:

Loosen hinge nut on FEED LIFTING ROCK SHAFT, Fig. 12, and turn eccentric hinge screw until high point of eccentric is toward rotary hook shaft. Then turn eccentric hinge screw as required to correct height.

Maintain this setting while tightening hinge nut.

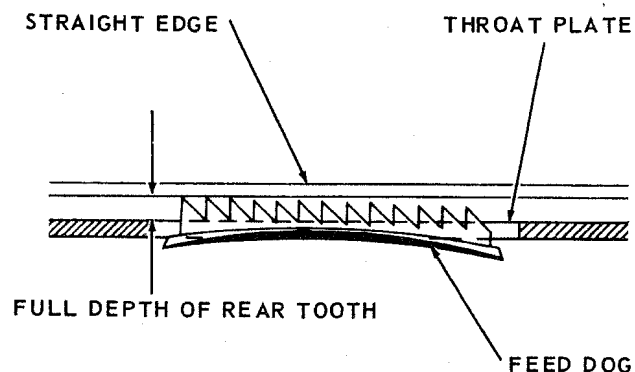


Fig. 11. Feed Dog at Correct Height

TO POSITION FEED DOG IN THROAT PLATE SLOTS

LENGTHWISE SETTING

PREPARATION:

Set feed dog height as previously instructed.

CHECK:

Feed dog should move as close as possible to front of throat plate slots without striking throat plate.

SETTING:

Loosen hinge nut on FEED ROCK SHAFT, Fig. 12, and turn eccentric hinge screw until high point of eccentric is away from rotary hook shaft. Then turn eccentric screw as required to bring feed dog in correct position.

Maintain this setting while tightening hinge nut.

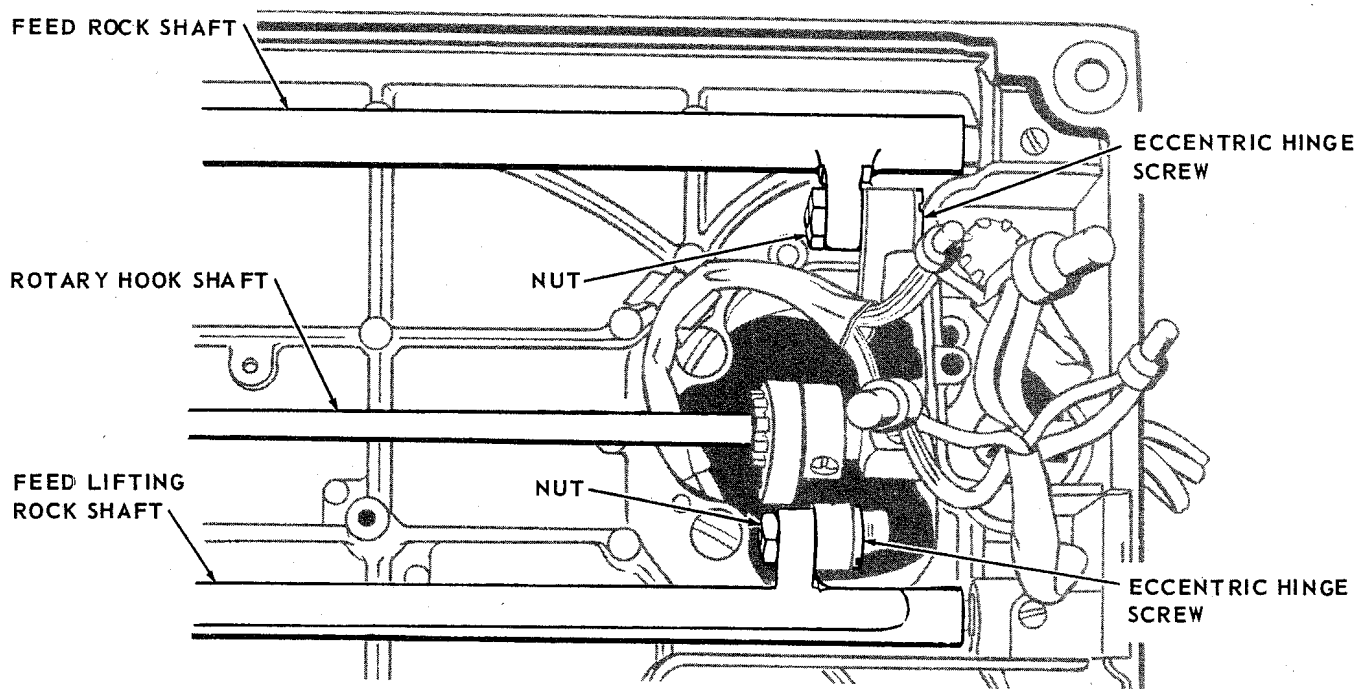


Fig. 12. Setting Height of Feed Dog and Positioning Lengthwise in Throat Plate Slots

TO POSITION FEED DOG (Cont'd)

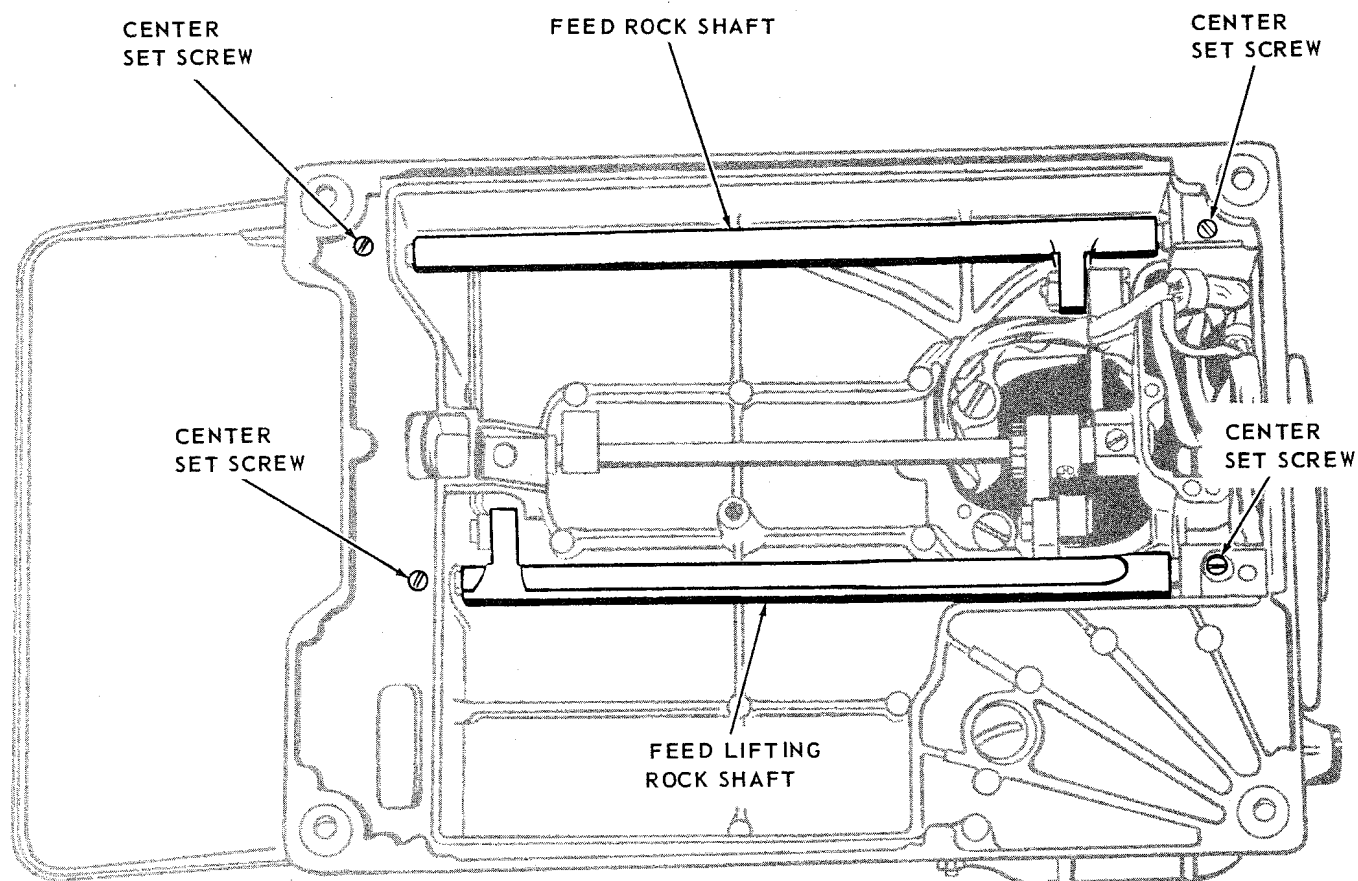


Fig. 13. Positioning Feed Dog Sidewise in Throat Plate

SIDewise SETTING:

PREPARATION:

Set feed dog height as previously instructed.

CHECK:

Feed dog should be centrally located between the sides of the feed slots of the throat plate.

SETTING:

Loosen the four center set screws, Fig. 13, holding the feed rock shaft and feed lifting rock shaft

centers in place. To move feed dog toward the left, gently tap the right hand center of the feed rock shaft and feed lifting rock shaft to the left until feed dog is correctly positioned. Then tighten the four set screws. To move feed dog toward the right, gently tap the left hand centers to the right until feed dog is correctly positioned.

NOTE: Check for end play or binding in feed rock shaft and feed lifting rock shaft. To adjust, loosen center set screw at right end of machine and move center as required.

TO SET NEEDLE BAR HEIGHT

USING TIMING MARK

CHECK:

Turn hand wheel over toward operator until needle bar is at its lowest point. At this position, upper timing mark, Fig. 14, should be just visible at lower edge of needle bar bushing.

SETTING:

Loosen clamp screw, Fig. 14, and raise or lower needle bar as required. Make certain needle bar is correctly turned with long groove in needle facing toward right of machine. Then tighten clamp screw.

WITHOUT USING TIMING MARK

If there is any belief that the needle bar bushing has been disturbed, it will be impossible to set the needle bar by use of the timing marks.

CHECK:

Remove bobbin case and bobbin. With needle threaded, hold thread end and turn hand wheel over toward operator until needle reaches its lowest point and rises approximately $1/10$ inch. At this point the needle thread loop should be fully formed, Fig. 15, and ready for entrance of hook point directly above needle eye.

SETTING:

Loosen clamp screw, Fig. 14, and raise or lower needle bar as required. Make certain long groove of needle is facing toward right of machine and tighten clamp screw. Then set the needle bar bushing.

TO SET NEEDLE BAR BUSHING

CHECK:

With needle bar set at correct height, turn hand wheel over toward operator until needle bar is at its lowest point. In this position the upper timing mark on the needle bar should be at bottom edge of the bushing.

SETTING:

Loosen needle bar bushing set screw, Fig. 14, and raise or lower bushing as required. Then tighten set screw.

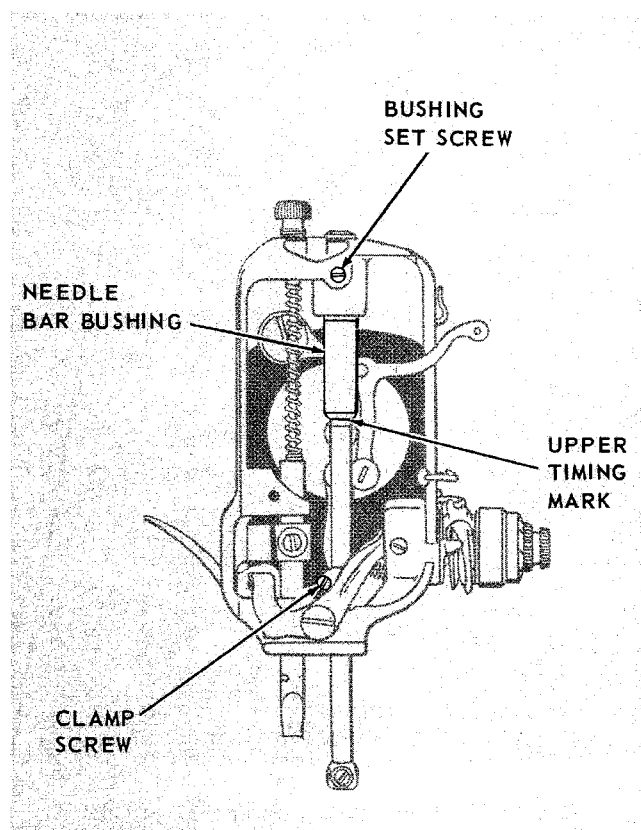


Fig. 14. Setting Needle Bar Height

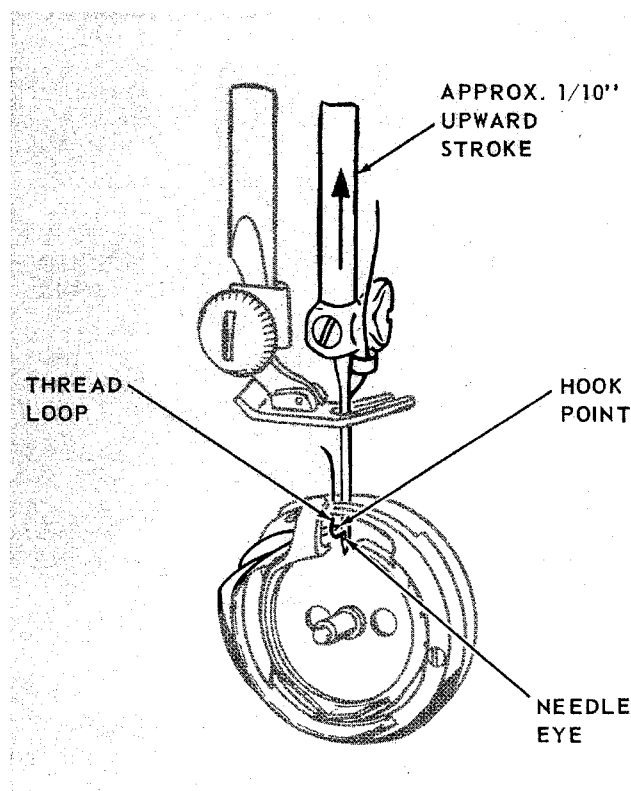


Fig. 15. Needle Thread Loop Formed

TO POSITION HOOK TO OR FROM NEEDLE

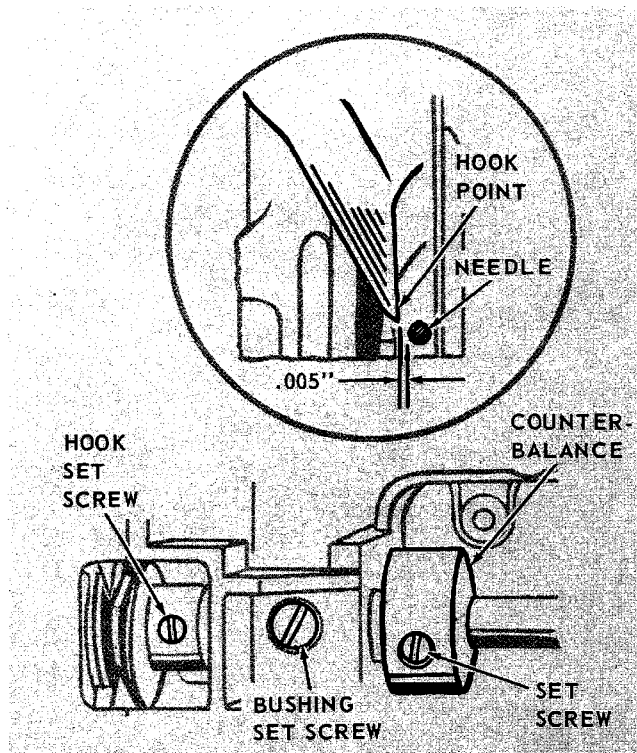


Fig. 16. Distance Between Needle and Hook

CHECK:

Remove throat plate and turn hand wheel over toward operator until lower timing mark on needle bar is at lower edge of needle bar bushing on its upward stroke. With needle bar in this position, the distance between the side of needle and point of hook, as shown in insert in Fig. 16, should be .005". This is approximately the thickness of a piece of ordinary note paper.

SETTING:

Loosen counterbalance set screw, Fig. 16, and move counterbalance away from bushing. Loosen one hook set screw. Turn balance wheel toward operator to position needle bar as instructed above. Loosen the other hook set screw and bushing set screw. Using a 1/4" brass drift pin, gently tap bushing to left or right as required. Press hook assembly against bushing and tighten hook and bushing set screws. Re-check setting and replace counterbalance with hub against bushing.

TO TIME THE HOOK

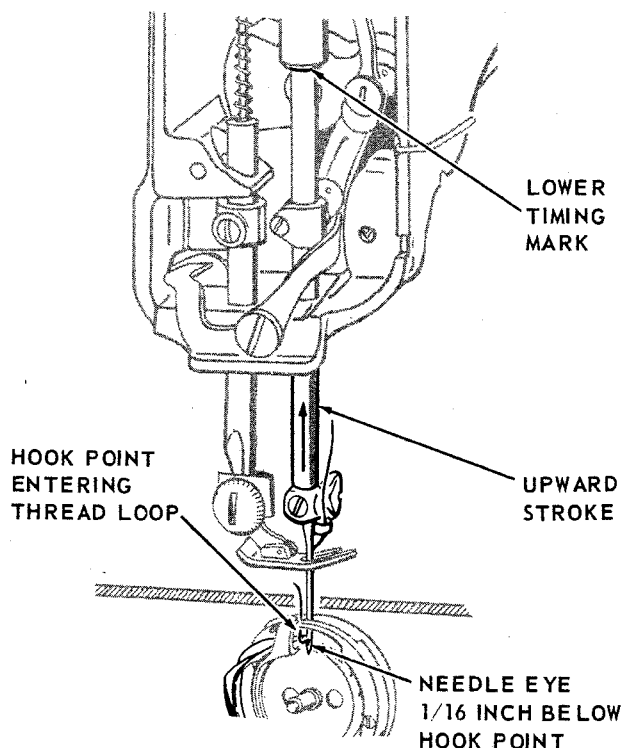


Fig. 17. Timing Hook

PREPARATION:

Set needle bar height and position of hook to or from needle as previously instructed.

CHECK:

With needle threaded, turn hand wheel over toward operator until needle bar reaches lowest point and rises to position where lower timing mark on needle bar, Fig. 17, is just visible at lower edge of needle bar bushing. With needle bar in this position, the point of the hook should be approximately 1/16" above the needle eye and entering the needle thread loop.

SETTING:

Remove bottom cover. Loosen rotating hook shaft pulley set screws, Fig. 18, or hook shaft bevel gear set screws in gear driven machines. Turn shaft manually until point of hook is in its correct position to the needle eye and needle thread loop, as shown in Fig. 17. While holding hook in this position, tighten

TO TIME THE HOOK (Cont'd)

set screws in pulley or bevel gear.

CAUTION: In gear driven machines, do not disturb mesh of bevel gears.

NEEDLE THREAD TENSION

TAKE-UP SPRING STROKE

CHECK:

The take-up spring, Fig. 19, should complete its action and be at rest against take-up spring stop as point of needle enters material.

SETTING:

To adjust the take-up spring stroke, loosen set screw, Fig. 19. Move slack thread regulator to the right to complete take-up spring action earlier (shorter stroke) or to the left to complete take-up spring action later (longer stroke). Then securely tighten set screw.

TAKE-UP SPRING TENSION

CHECK:

Tension on the take-up spring should be just sufficient to take up the slack of needle thread until point of needle enters material.

SETTING:

Turn tension dial to zero, remove face plate and loosen stud set screw, Fig. 20. Remove entire tension assembly from machine. Slide end of take-up spring, Fig. 20, out from groove in tension stud. Turn end of spring toward right (CLOCKWISE) to increase tension or toward left (COUNTERCLOCKWISE) to decrease tension and place it in nearest groove. Replace tension assembly, drawing take-up spring up so it rests on take-up spring stop, Fig. 19, and securely tighten set screw.

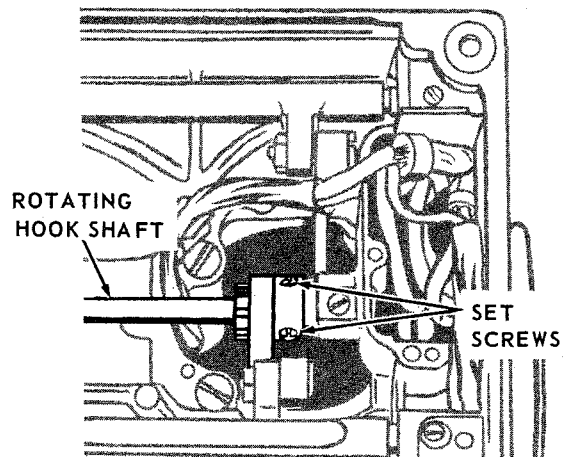


Fig. 18. Timing Hook

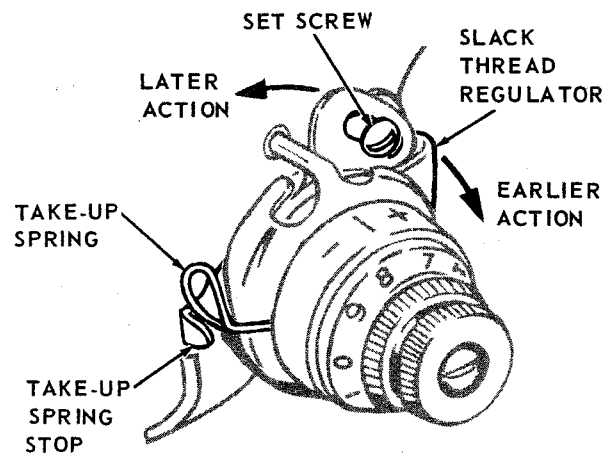


Fig. 19. Setting Take-up Spring Stroke

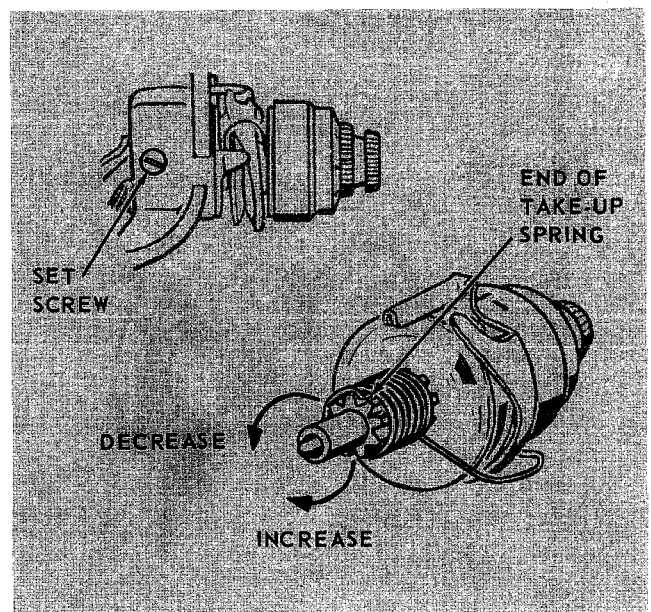


Fig. 20. Setting Take-up Spring Tension

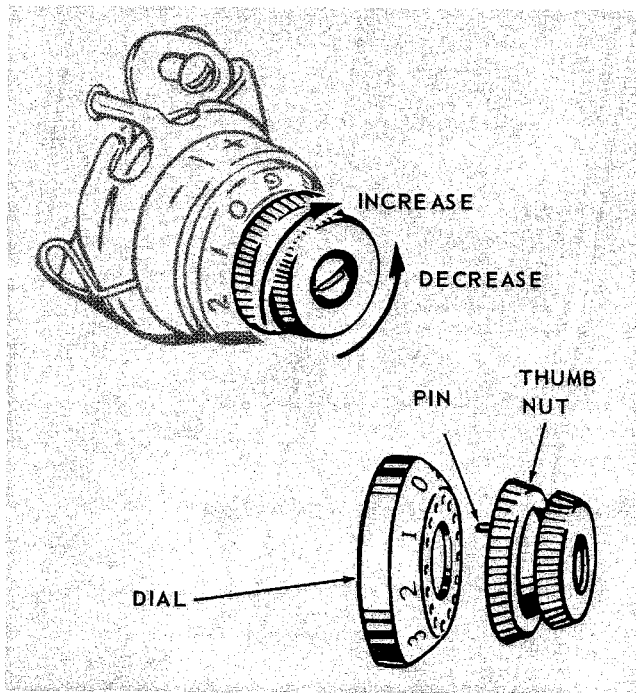


Fig. 21. Adjusting Needle Thread Tension

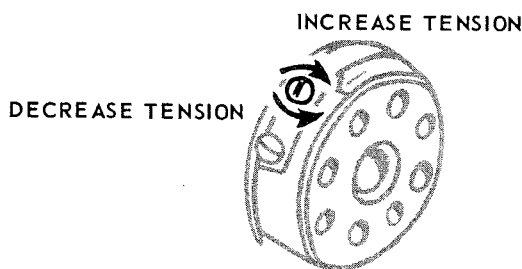


Fig. 22. Adjusting Bobbin Thread Tension

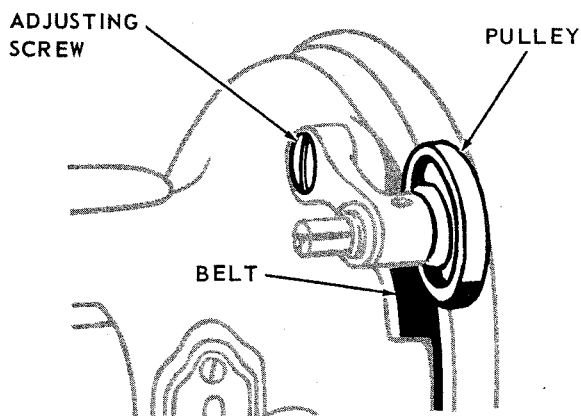


Fig. 23. Adjusting Bobbin Winder

TO ADJUST NEEDLE THREAD TENSION

CHECK:

With machine threaded, lower presser bar to engage tension and turn tension regulator dial to zero (0) position, Fig. 21. Hold thread on both sides of tension regulator and pull back and forth through tension discs. The tension on the thread should be just slightly perceptible, which gradually increases with the turning of the regulator dial to the right.

SETTING:

If the pull on the thread is too strong for minimum tension, press in numbered dial to disengage pin in thumb nut, Fig. 21, from dial. Reset pin in next hole to the left of previous setting. Repeat process until there is no tension on thread. Then advance pin one hole to the right to produce minimum tension at zero (0) position.

TO ADJUST BOBBIN THREAD TENSION

CHECK:

Remove threaded bobbin case and bobbin from machine. Hold end of bobbin thread allowing the bobbin case and bobbin to hang free. When tension is correctly adjusted, the bobbin case will descend slowly each time the thread is given a slight "jerk" upward. When using a tensiometer, a bobbin thread tension of approximately 50 grams is sufficient for No. 50-3 mercerized cotton.

SETTING:

Gradually turn tension regulating screw for either increased or decreased tension, as shown in Fig. 22.

TO ADJUST BOBBIN WINDER PRESSURE

CHECK:

The pressure of the bobbin winder pulley against the belt should be just enough to operate the bobbin winder without slippage.

SETTING:

Tighten adjusting screw, Fig. 23, sufficiently to increase pressure of pulley against belt.

TO ELIMINATE END PLAY OR BINDING OF HORIZONTAL ARM SHAFT

Should the horizontal arm shaft require adjustment for end play or binding, remove hand wheel as instructed on page 23 to expose hand wheel bushing. Loosen set screws, Fig. 24, and move hand wheel bushing slightly away from arm shaft bushing. Insert a .003 feeler gauge between the two bushings, move hand wheel bushing back against the feeler gauge, and tighten set screw. Replace hand wheel.

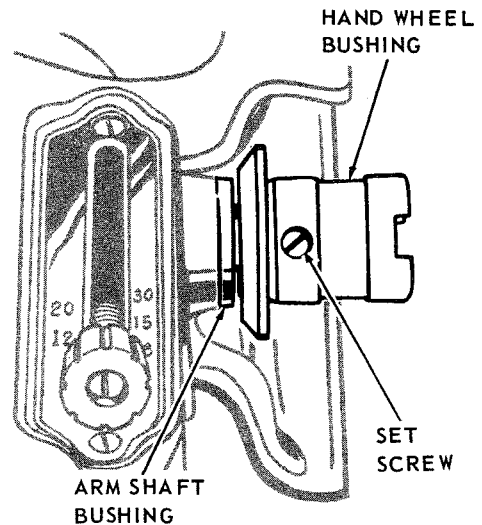


Fig. 24. Adjusting Arm Shaft End Play

TO ELIMINATE END PLAY OR BINDING OF UPRIGHT ARM SHAFT (GEAR DRIVEN MODELS)

Open top cover and remove bottom cover. Loosen set screws, Fig. 25, in lower vertical bevel gear. Press downward upon upright arm shaft. Set lower vertical bevel gear firmly against lower bushing in casting and securely tighten gear set screw.

Check mesh of upper and lower vertical and horizontal bevel gears to ascertain that they are fully meshed. To adjust, loosen horizontal bevel gear set screws, Fig. 25, and slide gear to position where it is correctly meshed with vertical gear. Then tighten set screws and replace covers.

CAUTION: Bevel gears must always be kept in mesh at all times.

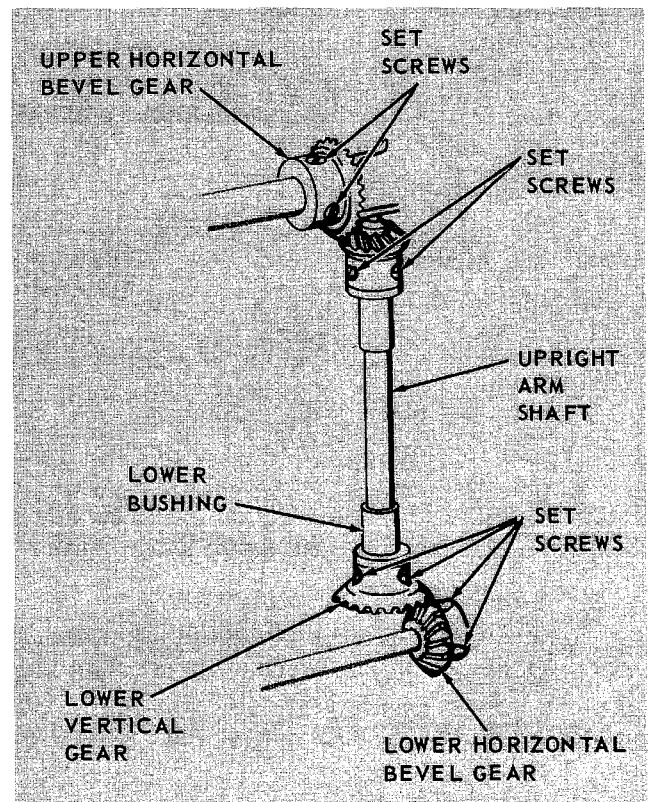


Fig. 25. Adjusting Upright Arm Shaft End Play

TO ELIMINATE END PLAY OR BINDING OF HOOK DRIVING SHAFT

Binding may be caused by lack of lubrication or foreign material obstructing moving parts. Clean and lubricate as instructed on page 5.

To eliminate end play or binding in hook driving shaft, loosen counterbalance set screw and bushing set screw, Fig. 26. Position shaft as required to eliminate binding or end play and move bushing against the hook, taking care to maintain correct

clearance between needle and hook, see page 10. Place counterbalance against bushing and tighten set screws. In gear-driven machines, it may be necessary to loosen set screws in horizontal hook shaft bevel gear while making this adjustment. Then tighten set screws.

Recheck clearance between needle and hook and check the hook timing. See page 10.

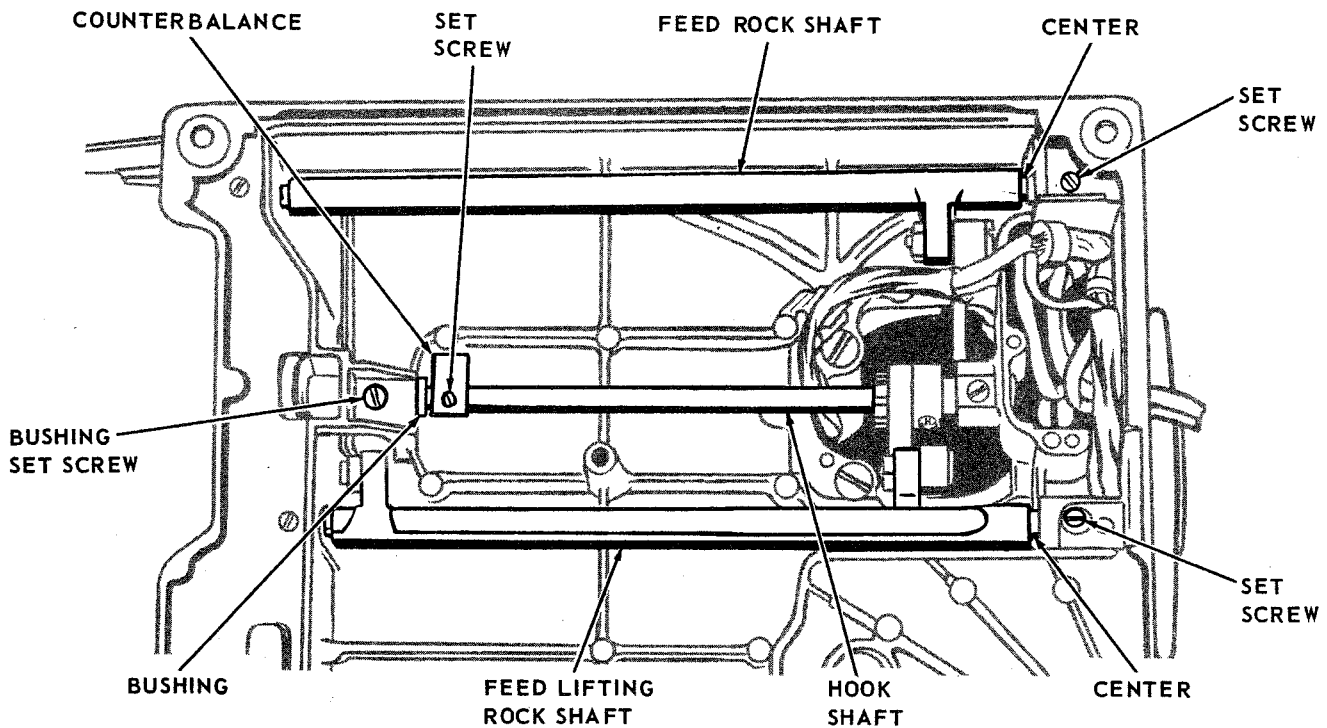


Fig. 26. Eliminating End Play or Binding Beneath Machine Bed

TO ELIMINATE END PLAY OR BINDING OF FEED ROCK SHAFT AND FEED LIFTING ROCK SHAFT

To eliminate end play or binding of feed rock shaft, loosen set screw at right end of shaft, Fig. 26, and adjust center shown so that shaft rides snugly but freely, (without left or right movement).

Securely tighten set screw.

To eliminate end play or binding of feed lifting

rock shaft, loosen set screw at right end of shaft, Fig. 26, and adjust center shown as required.

Securely tighten set screw.

Check position of feed dog and adjust as required. See page 6.

REMOVALS AND REPLACEMENTS

NEEDLE BAR

REMOVAL:

1. Remove face plate.
2. Loosen set screw in needle clamp as shown in Fig. 27 and remove clamp.
3. Loosen clamping screw, Fig. 27, and lift needle bar up through bushing and out of machine.

REPLACEMENT:

1. Insert needle bar down through bushing shown in Fig. 27.
2. Replace needle clamp and tighten set screw.
3. Adjust needle bar height as instructed on page 9.
4. Make certain the needle bar is turned correctly, then tighten clamping screw.
5. Replace face plate.

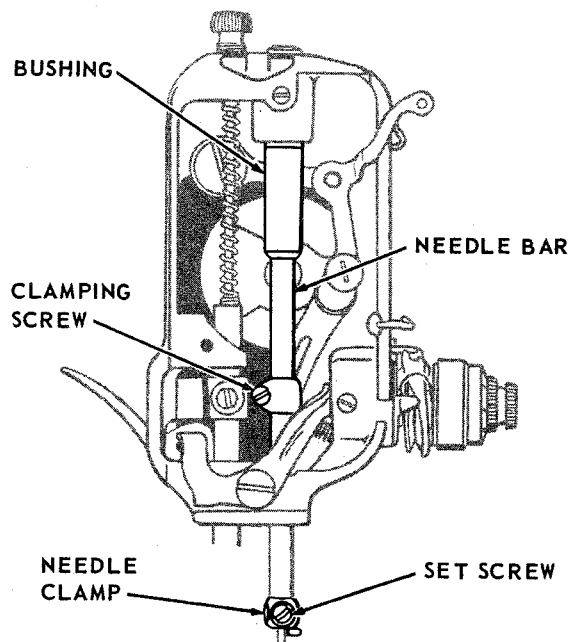


Fig. 27. Removing Needle Bar

PRESSER BAR

REMOVAL:

1. Remove face plate.
2. Remove presser foot and thumb screw.
3. Remove pressure regulating thumb screw, extension pin and spring, as shown in Fig. 28.
4. Remove thread cutter (earlier machines only).
5. Loosen guide bracket set screw, Fig. 28, and lift presser bar up and out.

REPLACEMENT:

1. Replace presser bar through guide bracket, Fig. 28, and bushing.
2. Replace extension pin, spring and regulating thumb screw.
3. Replace foot and thumb screw.
4. Set presser bar at correct height, see page 6, and align foot with throat plate slots.
5. Tighten guide bracket set screw.
6. Replace face plate.

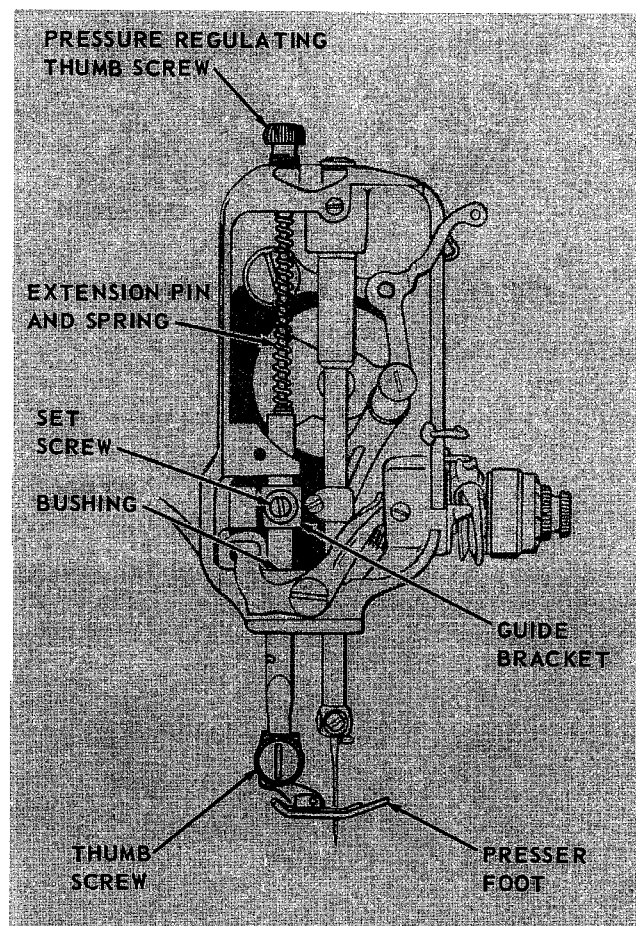


Fig. 28. Removing Presser Bar

REMOVALS AND REPLACEMENTS

NEEDLE THREAD TAKE-UP

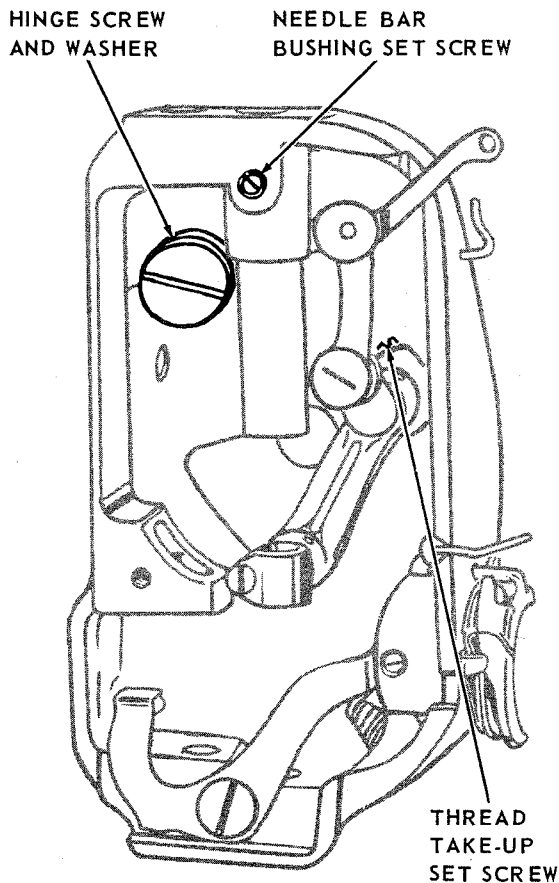


Fig. 29. Removal of Thread Take-up

REMOVAL:

1. Remove face plate.
2. Remove presser bar and needle bar as instructed on page 15.
3. Loosen set screw, Fig. 29, and remove needle bar bushing.
4. Remove hinge screw and washer.
5. Turn hand wheel until thread take-up set screw, Fig. 29, is accessible through access hole in rear of machine.
6. Loosen thread take-up set screw and remove take-up linkage.

CAUTION: Take-up lever cap screw has a left hand thread. For removal, it must be turned **CLOCKWISE**

REPLACEMENT:

1. Replace take-up linkage in reverse order instructed for removal with flat of stud toward thread take-up set screw, Fig. 29.
2. Replace washer, take-up link and hinge screw.
3. Replace needle bar bushing.
4. Replace needle bar and presser bar as instructed on page 15.
5. Set presser bar height, as instructed on page 6, and needle bar height (without timing marks) as instructed on page 9.
6. Set needle bar bushing as instructed on page 9, and replace face plate.

NEEDLE THREAD TENSION

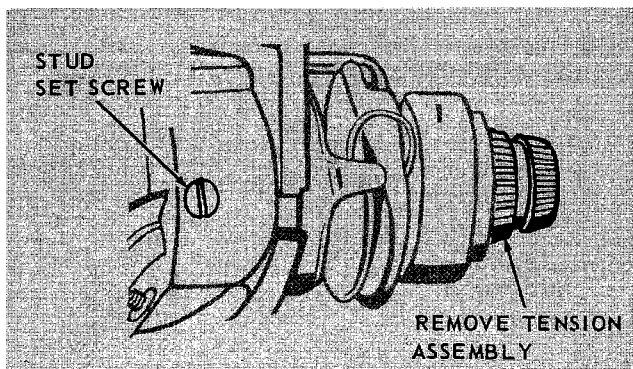


Fig. 30. Removal of Tension Assembly

REMOVAL:

1. Turn thumb nut to left until zero (0) on dial reaches indicator line.
2. Loosen stud set screw, Fig. 30, and remove entire assembly from machine.
3. Press in on dial, Fig. 31, disengage pin in thumb nut from hole in dial.
4. Hold dial in and remove thumb nut.
5. Remove dial, stop washer, tension spring, indicator and tension disc assembly which includes thread guard, two discs and take-up spring.

REMOVALS AND REPLACEMENTS

NEEDLE THREAD TENSION (Cont'd)

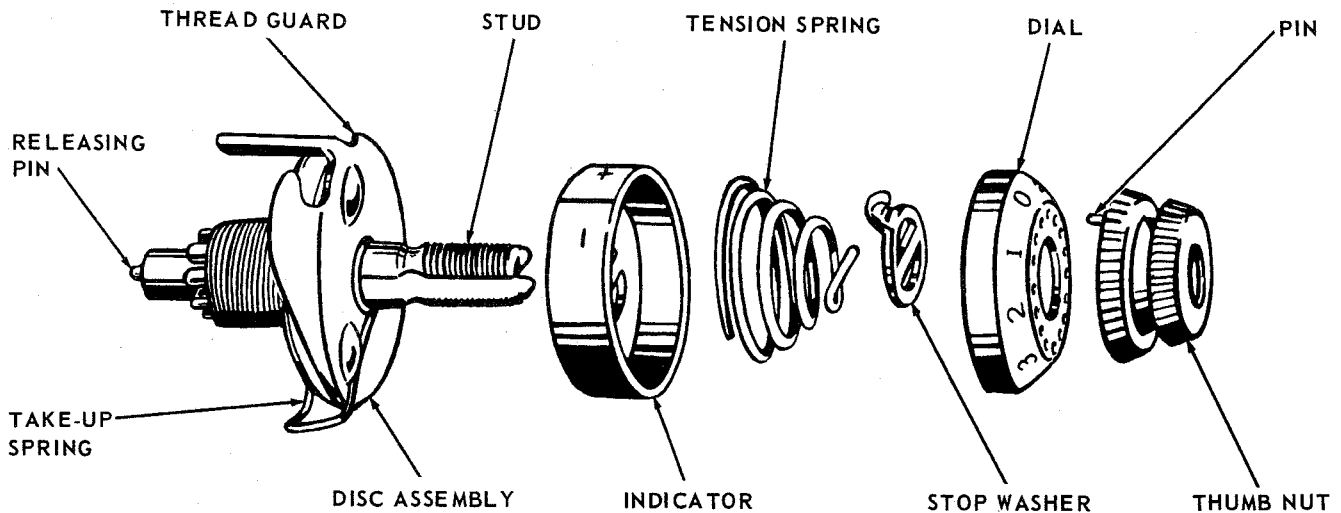


Fig. 31 Needle Thread Tension Assembly

REPLACEMENT:

1. Make certain that releasing pin is in place as shown in Fig. 31.
2. Place tension discs, with convex sides together, on thread guard as shown in Fig. 32.
3. Pass eyelet of take-up spring under thread guard, keeping coils of spring above tension discs as shown in Fig. 32.
4. Align coils of spring with hole in discs and place this assembly on stud as shown in Fig. 33. Tail of thread guard enters hole provided in machine head.

Note: Tail of spring, Fig. 33, enters one of the grooves in rear of stud. (See instructions for setting take-up spring, page 11.)

5. Replace indicator, open side out, on stud with plus and minus indications at top as shown in Fig. 31.
6. Insert tension spring into indicator and replace stop washer as shown in Fig. 31.
7. Place numbered dial on stud with numeral 2 opposite stop washer extension. Press in dial to compress spring. While holding in, replace thumb nut, carefully guiding pin into one of the holes in the dial.
8. Replace entire tension assembly into machine and tighten set screw.
9. Adjust tension as instructed on pages 11 and 12.

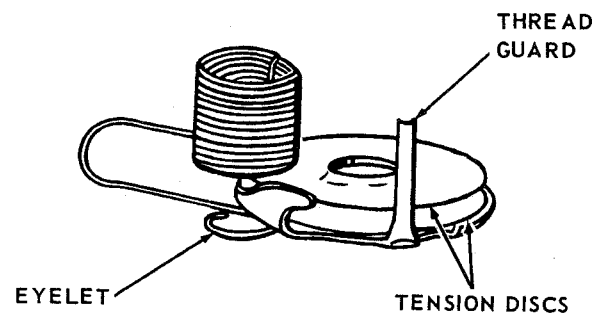


Fig. 32. Tension Disc Assembly

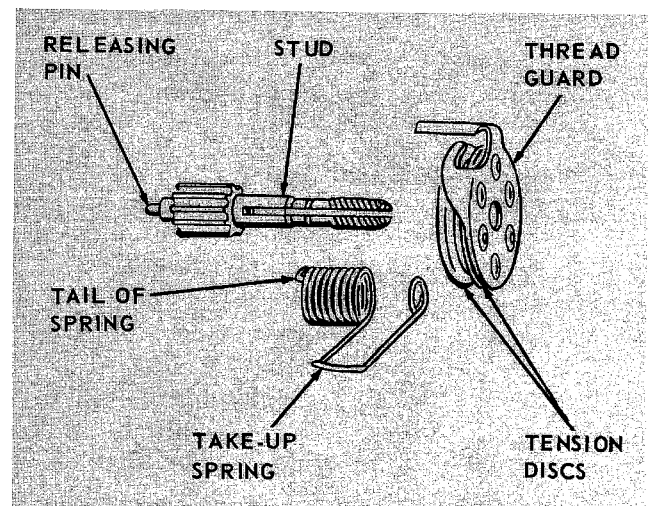


Fig. 33. Take-up Spring Unit

REMOVALS AND REPLACEMENTS

BOBBIN CASE BASE (LATEST STYLE)

REMOVAL:

1. Remove throat plate and bobbin case.
2. Remove gib screw, Fig. 34, and displace gib as shown in Fig. 35.
3. Turn bobbin case base so small point on bobbin case base is beneath point of sewing hook as shown in Fig. 35.
4. Remove base by lifting upward and out.

REPLACING:

1. Replace bobbin case base in position as shown in Fig. 35. Rotate it slightly until it seats.
2. Return gib to original position and replace screw.
3. Replace throat plate, making certain that the position finger is in notch of position plate under throat plate.

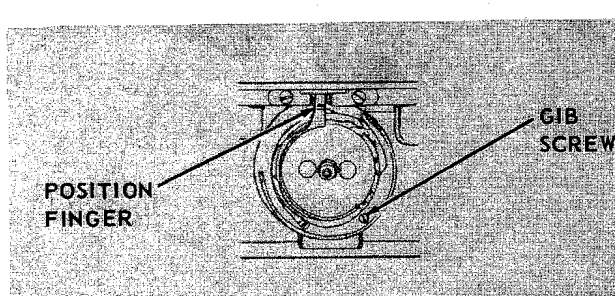


Fig. 34. Removing Gib Screw

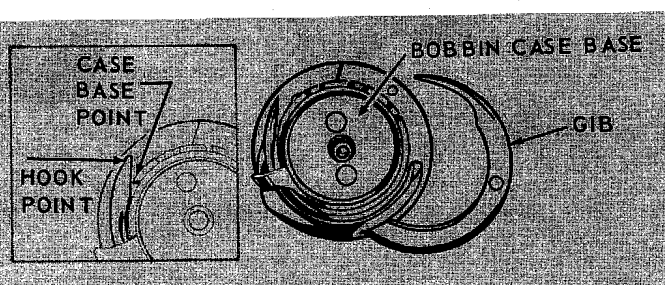


Fig. 35. Removal of Bobbin Case Base

BOBBIN CASE BASE (OLD STYLE)

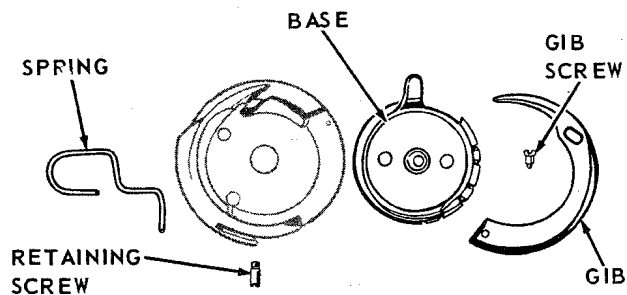


Fig. 36. Sewing Hook Disassembled

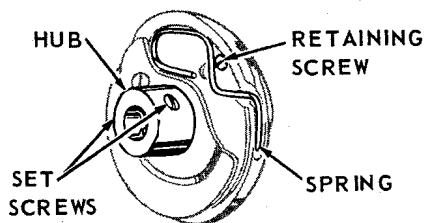


Fig. 37. Rear View of Sewing Hook

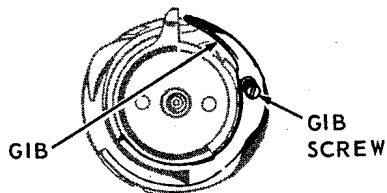


Fig. 38. Removal of Gib Screw and Gib

REMOVAL:

1. Remove throat plate, bobbin case and bottom cover.
2. Loosen two set screws in hub of hook, Fig. 37, and remove hook from hook shaft.
3. Remove retaining screw and spring, Fig. 37, from rear of hook.
4. Remove gib screw and gib, Fig. 38, from front of hook.
5. Lift bobbin case base from face of hook.

REPLACEMENT:

1. Place base in its seat in hook.
2. Replace gib and gib screw on front of hook as shown in Fig. 38.
3. Replace spring and retaining screw on rear of hook as shown in Fig. 37.
4. Replace hook on hook shaft, position in relation to needle and reset time as instructed on page 10.
5. Replace bottom cover and throat plate.

REMOVALS AND REPLACEMENTS

ROTATING HOOK ASSEMBLY

REMOVAL:

1. Remove needle, throat plate and bobbin case.
2. Turn machine over on rear side and remove bottom cover.
3. Loosen two set screws, Fig. 39, in hub of hook assembly.
4. Remove assembly from hook shaft.

REPLACEMENT:

1. Replace assembly on hook shaft.
2. Replace needle.

3. Adjust clearance between hook and needle, and reset timing. (See page 10 for instructions.)
4. Replace bottom cover, bobbin case and throat plate.

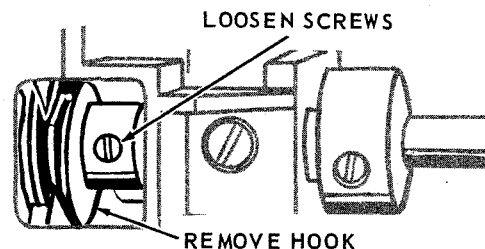


Fig. 39. Removing Hook Assembly

ROTATING HOOK SHAFT (GEAR-DRIVEN MACHINES)

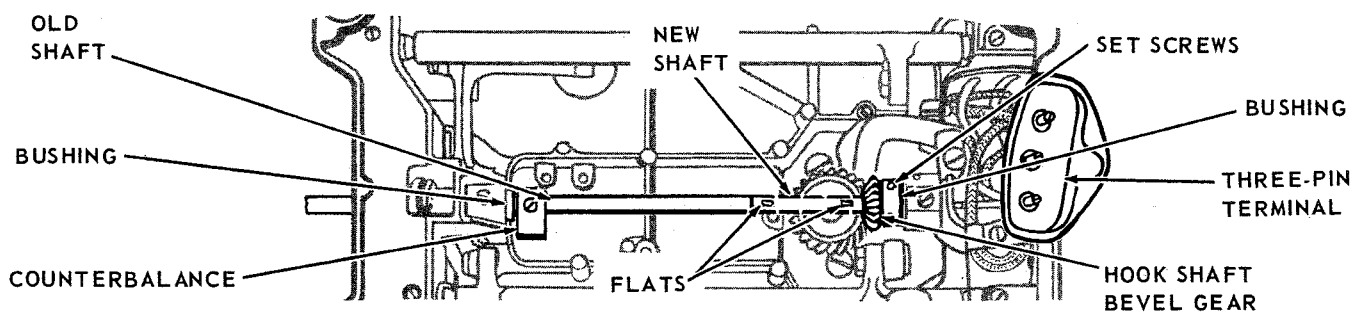


Fig. 40. Removing Hook Shaft

REMOVAL:

1. Remove needle, throat plate, bobbin case and bottom cover.
2. Remove rotating hook assembly, as previously instructed, and bobbin case base as instructed on page 18.
3. Loosen counterbalance set screw and hook shaft bevel gear set screws. (See Fig. 40.)
CAUTION: MARK RELATIVE POSITION OF MATED BEVEL GEARS to insure proper mesh on later assembly.
4. Remove screw holding the three-pin terminal, Fig. 40, and carefully push aside the wiring to expose right end of hook shaft.
5. Using new shaft as a tool, push old shaft out through left end of machine. Make certain that the inserted end of the new shaft presents the flats, Fig. 40, on which the rotary hook set screw and counterbalance set screw, respectively, are to be tightened.

REPLACEMENT:

1. Replace rotating hook on hook shaft being certain that left end of shaft is flush with face of hook, when hub of hook is against shaft bushing. The set screw in hub, nearest the hook point, should engage flat of shaft. Tighten set screws in hub.
2. Check position marking on hook shaft bevel gear and tighten set screws while gear is against bushing at right end of shaft.
3. Hold counterbalance against bushing and tighten set screw against flat of shaft.
4. Reassemble the bobbin case base in the hook. (In machines using the old style hook, it will be necessary to remove the hook from the shaft. See instructions on page 18.)
5. Check for binding and end play, as instructed on page 14.
6. Replace needle and adjust clearance between hook and needle and reset hook timing, as instructed on page 10.
7. Replace three-pin terminal, bottom cover, bobbin case and throat plate.

REMOVALS AND REPLACEMENTS

ROTATING HOOK SHAFT (BELT DRIVEN MACHINES)

REMOVAL:

Proceed as instructed for gear-driven machines except as follows:

1. Do not disturb wiring.
2. Loosen set screws in hook shaft pulley, Fig. 41, counterbalance and hook assembly. Remove old shaft out through left end of machine. **Do not use new shaft as a tool.**

REPLACEMENT:

Proceed as instructed for gear-driven machines except as follows:

1. Insert new shaft from the left.
2. Insert shaft through pulley and belt. Place pulley against right end bushing and tighten set screws.

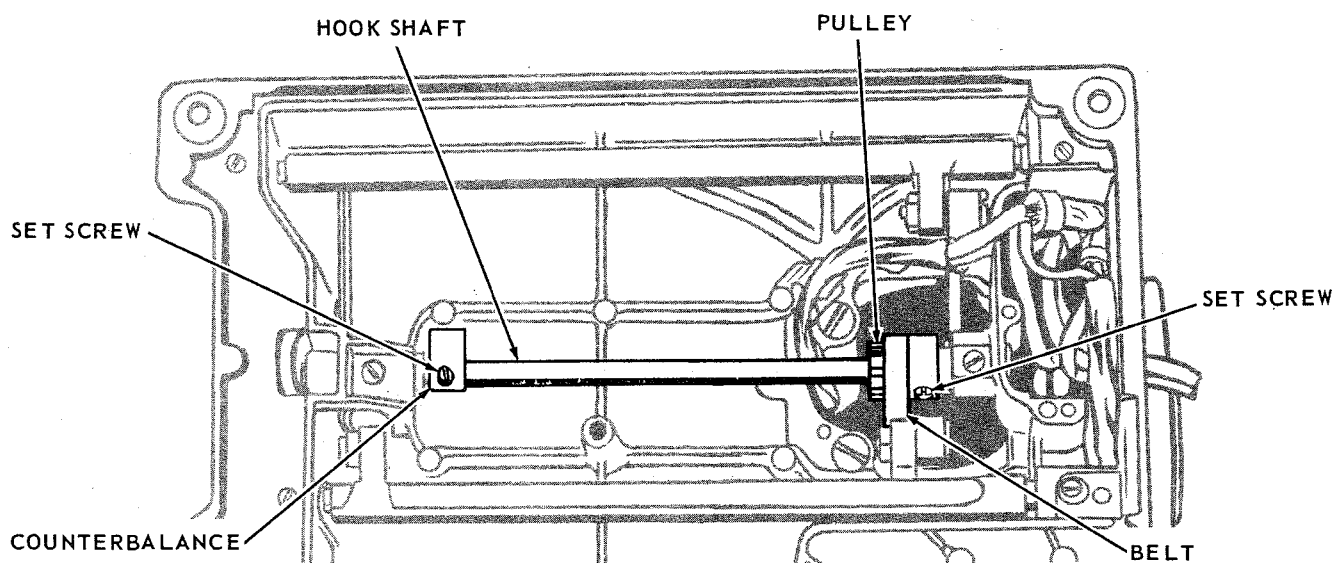


Fig. 41. Removing Hook Shaft

FEED REGULATOR

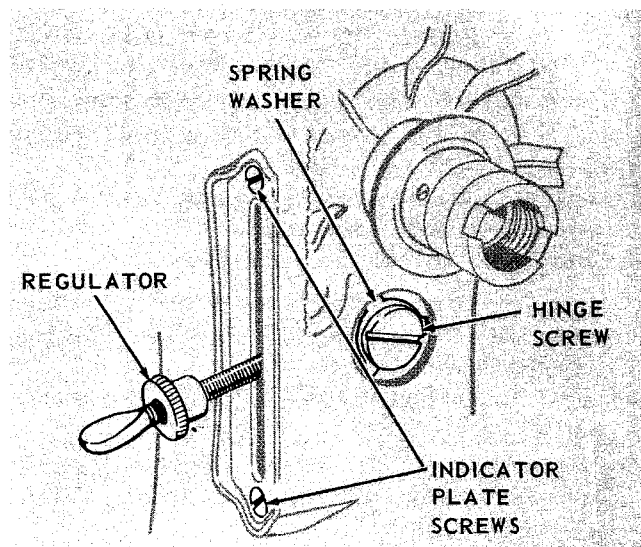


Fig. 42. Removing Feed Regulator

REMOVAL:

1. Remove hand wheel as instructed on page 23.
2. Remove stitch indicator plate screws, Fig. 42, regulator hinge screw and spring washer.
3. Remove feed regulator and indicator plate as a unit.

REPLACEMENT:

1. Insert regulator into the machine. Make certain that the roller of feed forked connection rides in slideway of regulator block.
2. Replace hinge screw and washer. The prongs of the washer should face inward.
3. Replace indicator plate screws.
4. Replace hand wheel as instructed on page 23.

REMOVALS AND REPLACEMENTS

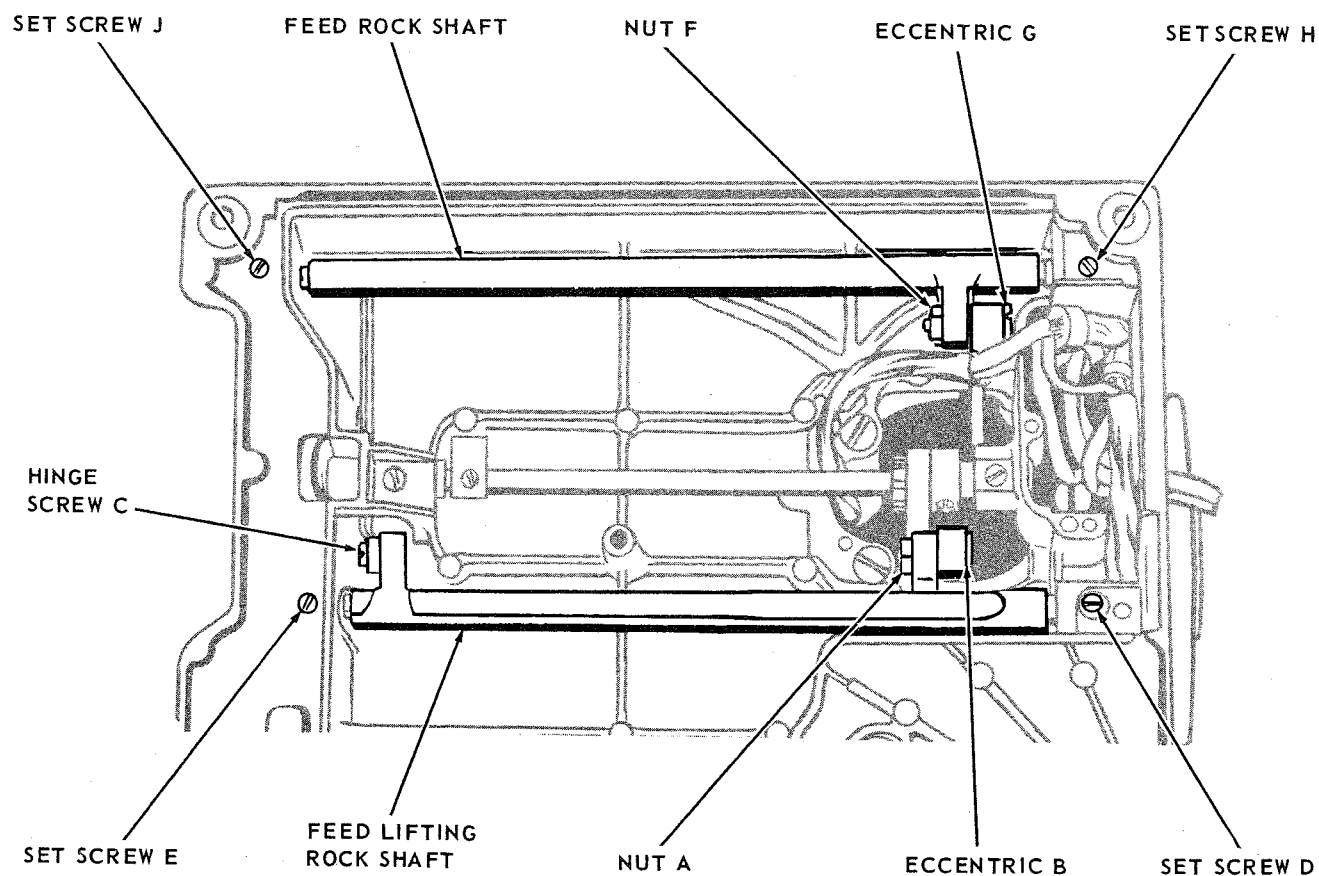


Fig. 43. Removing and Replacing Rock Shafts

FEED LIFTING ROCK SHAFT

REMOVAL:

1. Remove bottom cover.
2. Remove nut **A** and eccentric **B**, Fig. 43, disengaging feed lifting rock shaft from feed connecting rod.
3. Using an offset screw driver, remove hinge screw **C**, disengaging feed bar.
4. Loosen center set screws **D** and **E**, slide the shaft centers aside and remove feed lifting rock shaft.

REPLACEMENT:

1. Install feed lifting rock shaft in reverse order of its removal.
2. Adjust feed dog as instructed on pages 6, 7 and 8.
3. Replace bottom cover.

FEED ROCK SHAFT ASSEMBLY

REMOVAL:

1. Remove bottom cover
2. Remove nut **F** and eccentric **G**, Fig. 43, disengaging feed rock shaft from feed forked connection.
3. Using an offset screw driver, remove hinge screw **C**, disengaging feed lifting rock shaft.
4. Loosen center set screws **H** and **J**, slide the shaft centers aside and remove feed rock shaft with feed bar and feed dog.

REPLACEMENT:

1. Install feed rock shaft with feed bar and feed dog in reverse order of its removal.
2. Replace feed lifting hinge screw.
3. Adjust feed dog as instructed on pages 6, 7 and 8.
4. Replace bottom cover.

REMOVALS AND REPLACEMENTS

FEED LIFTING ROCK SHAFT CONNECTING ROD

REMOVAL:

1. Loosen top cover screw and turn cover aside.
2. Remove two cap screws, Fig. 44, and remove connecting rod cap.
3. Remove bottom cover.
4. Remove eccentric screw and nut, Fig. 45, disengaging connecting rod from feed lifting rock shaft.
5. Remove connecting rod through bottom of machine.

REPLACEMENT:

1. Insert connecting rod into upright arm through bottom of machine, so that it fits around bottom half of pulley (or gear) hub on eccentric, Fig. 44.
2. Replace connecting rod cap and fasten with cap screws.
3. Replace eccentric screw and nut, Fig. 45, engaging connecting rod to feed lifting rock shaft.
4. Adjust feed dog height as instructed on pages 6 and 7.
5. Replace bottom cover and close top cover.

FEED FORKED CONNECTION

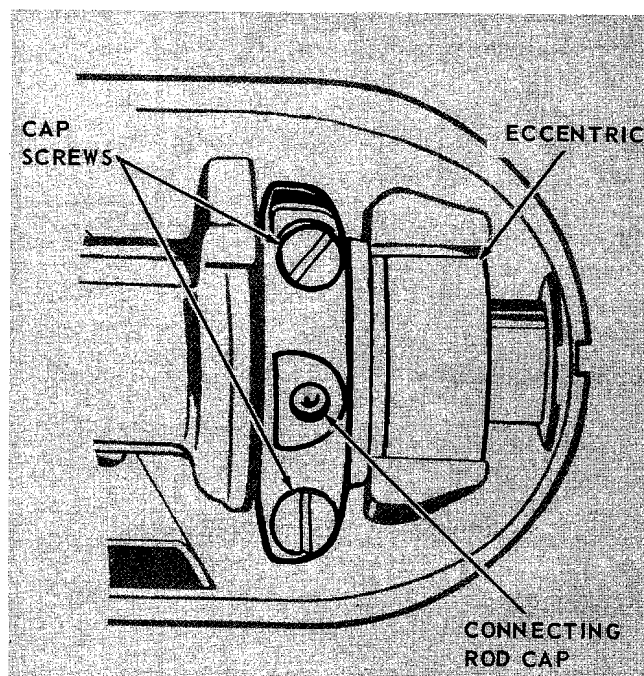


Fig. 44. Removing Feed Connecting Rod

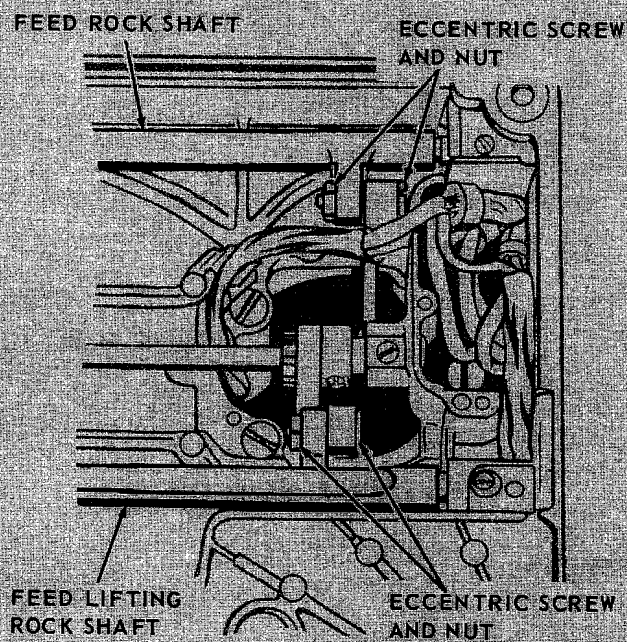


Fig. 45. Removing Feed Connecting Rod and Feed Fork

REMOVAL:

1. Remove feed regulator as instructed on page 20.
2. Open top cover and remove bottom cover.
3. Remove eccentric screw and nut, Fig. 45, disengaging feed forked connection from feed rock shaft.
4. Remove feed forked connection through bottom of machine.

REPLACEMENT:

1. Insert feed forked connection into upright arm through bottom of machine, so that it fits around eccentric, as shown in Fig. 44.
2. Replace eccentric screw and nut, Fig. 45, engaging feed forked connection to feed rock shaft.
3. Replace feed regulator as instructed on page 20.
4. Adjust position of feed dog as instructed on pages 7 and 8.
5. Replace bottom cover and close top cover.

REMOVALS AND REPLACEMENTS

UPRIGHT ARM SHAFT (GEAR-DRIVEN MACHINES)

CAUTION: Do not remove the upright arm shaft from this machine. If this becomes necessary, the machine should be returned to the factory.

The two sets of bevel gears have been lapped together at the factory and should be kept in mesh throughout all removals and replacements.

HAND WHEEL

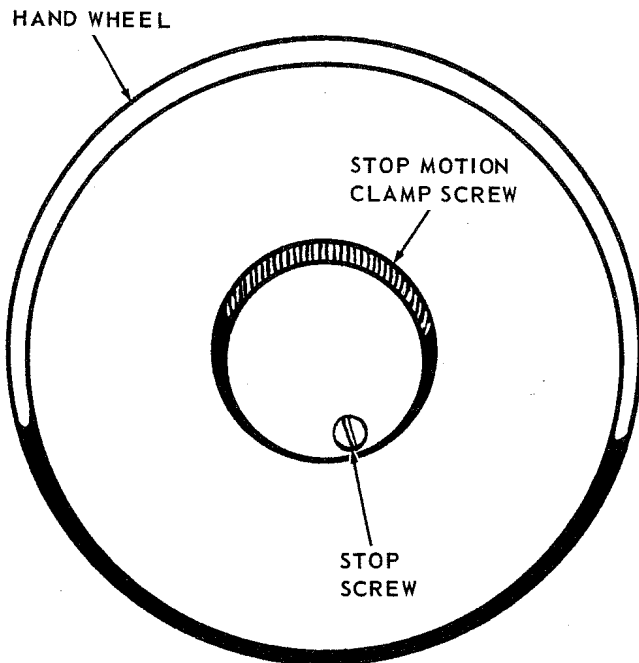


Fig. 46. Removing Hand Wheel

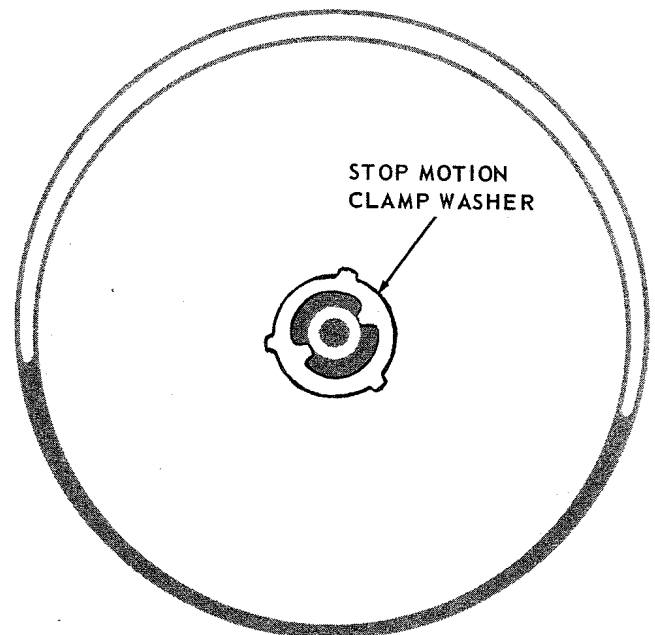


Fig. 47. Removing Clamp Washer

REMOVAL:

1. Loosen motor mounting screw and remove belt.
2. Hold hand wheel and loosen stop motion clamp screw, Fig. 46, by turning toward left.
3. Loosen stop screw, Fig. 46, until end clears stop motion washer. Then turn clamp screw toward left and out of the bushing.
4. Remove stop motion clamp washer, Fig. 47, and slide hand wheel out and off the bushing.

REPLACEMENT:

1. Replace hand wheel on bushing.
2. Replace stop motion clamp washer with lugs inserted in recess provided for them in the bushing.
3. Replace clamp screw and then tighten stop screw.

NOTE: If stitching mechanism is not released when stop motion clamp screw is loosened, remove stop motion clamp washer and rotate it 180°.

REMOVALS AND REPLACEMENTS

HORIZONTAL ARM SHAFT

REMOVAL:

1. Remove needle bar, presser bar and needle thread take-up as instructed on pages 15 and 16.
2. Remove arm top cover.
3. Remove hand wheel as instructed on page 23.
4. Loosen and remove set screw, Fig. 48, and remove stop motion bushing.
5. Loosen eccentric set screw, Fig. 49. (In gear-driven machines, it will also be necessary to loosen the two set screws in arm shaft bevel gear.)
6. Slide arm shaft toward left and out through the face plate end of machine.

REPLACEMENT:

1. Insert hand wheel end of arm shaft through bushing at face plate end of machine.
2. Slide shaft through eccentric and then through

bushing at hand wheel end on belt driven machines. On gear-driven machines, slide shaft through bevel gear then through eccentric and then through bushing.

3. In gear-driven machines, position arm shaft so the tapered set screw in bevel gear seats in positioning groove of shaft. Then tighten the two set screws. **Do not turn gear. Turn shaft only.**
4. Position eccentric so that the set screw seats in the positioning groove, Fig. 49, of the arm shaft. Then tighten set screw.
5. Replace needle thread take-up, needle bar and presser bar as instructed on pages 15 and 16.
6. Replace stop motion bushing and adjust for end play as instructed on page 13.
7. Replace hand wheel as instructed on page 23.
8. Remove bottom cover and check adjustment of rotary hook timing as instructed on pages 10 and 11.
9. Replace top and bottom covers.

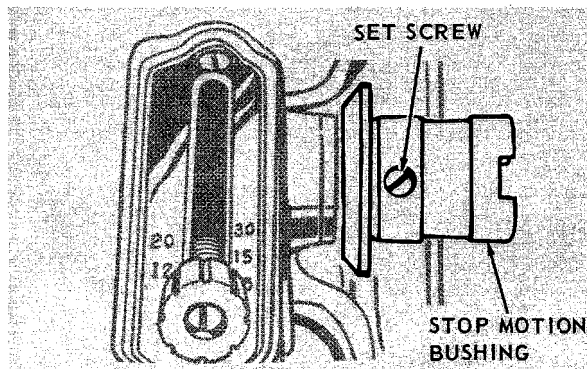


Fig. 48. Removing Stop Motion Bushing

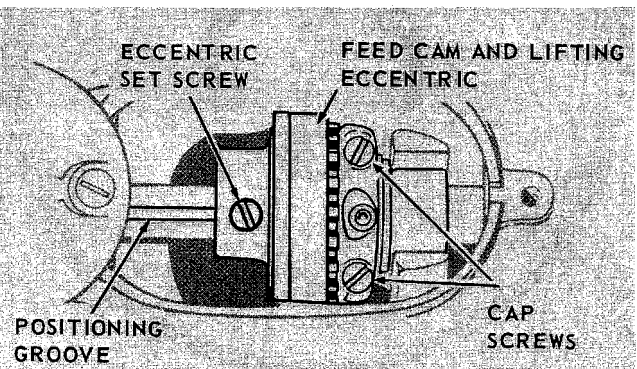


Fig. 49. Removing Horizontal Arm Shaft

ARM SHAFT CONNECTION BELT (BELT DRIVEN MACHINES)

REMOVAL:

1. Remove arm cover and bottom cover.
2. Follow procedure for removal of rotary hook shaft, as instructed on page 20. Do not remove shaft entirely from machine. Displace shaft toward left sufficiently to remove belt from pulley.
3. Remove cap screws, Fig. 49, from connecting rod and remove cap.
4. Remove horizontal arm shaft as instructed above.
5. Lift feed-cam-and-lifting-eccentric, including belt, up and out of machine.

REPLACEMENT:

1. Place belt around pulley on feed-cam-and-lifting-eccentric.
2. Insert eccentric with belt into position with eccentrics resting on feed fork and connecting rod, as shown in Fig. 49.
3. Replace connecting rod cap and cap screws.
4. Replace horizontal arm shaft as instructed above.
5. Place lower portion of belt around hook shaft pulley and replace hook shaft as instructed on page 20.
6. Check rotary hook timing as instructed on pages 10 and 11.

REMOVALS AND REPLACEMENTS

MOTOR

CAUTION: Remove plug from electric outlet before removing any electrical parts from machine.

WITH THREE-PIN TERMINAL

REMOVAL:

1. Remove bottom cover.
2. Loosen motor mounting screw, Fig. 50, and remove motor belt.
3. Remove three-pin terminal fastening screw, Fig. 50.
4. From reverse side of terminal, disconnect black motor lead from terminal pin 2 and red lead from terminal pin 3, as shown in Fig. 51.
5. Loosen motor leads clamping bracket screw in base of machine.
6. Remove motor mounting screw, Fig. 50, and remove motor, drawing motor leads out through opening in machine frame.

REPLACEMENT:

1. Replace motor and wiring in reverse order of its removal.
2. Replace motor belt and adjust belt tension.

MOTOR MOUNTING
SCREW

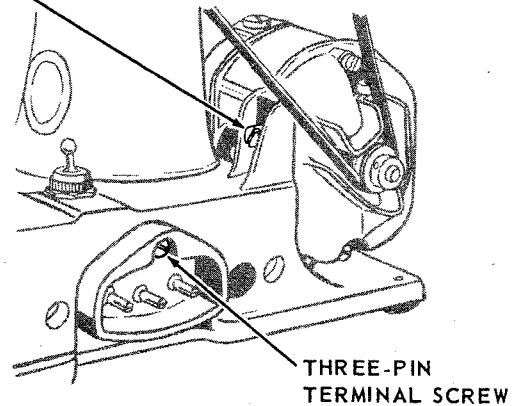


Fig. 50. Removing Motor

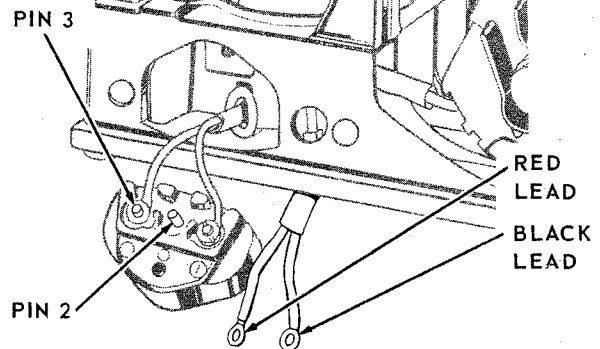


Fig. 51. Removing Three-Pin Terminal

WITHOUT THREE-PIN TERMINAL

REMOVAL:

1. Remove bottom cover.
2. Loosen motor mounting screw, Fig. 50, and remove motor belt.
3. From bottom of machine, disconnect motor leads from controller and power leads as shown in Fig. 52.
4. Mark or tag all leads to aid in reconnection during replacement.
5. Remove motor mounting screw, Fig. 50 and remove motor, drawing motor leads out through opening in machine frame.

REPLACEMENT:

1. Replace motor and wiring in its reverse order of its removal.
2. Replace motor belt and adjust belt tension.

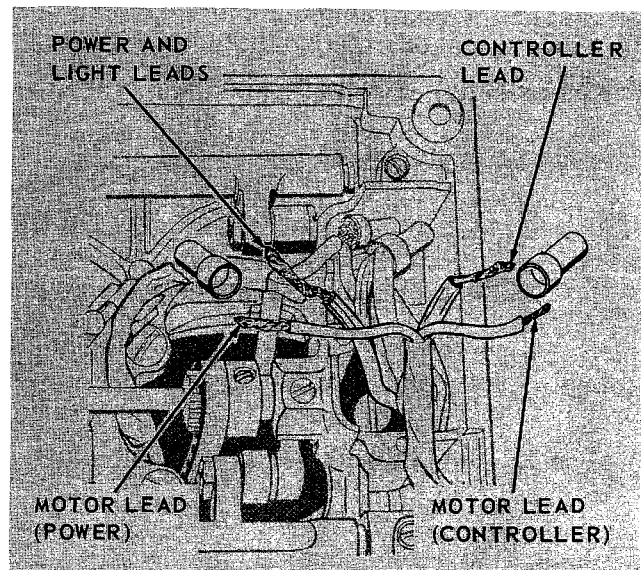


Fig. 52. Disconnecting Motor Leads

**SEWING DIFFICULTIES
HINTS FOR ADJUSTERS AND MECHANICS**

CHECK THESE POINTS

WHEN MACHINE IS NOISY

CHECK:

Excessive end play in hook driving shaft. (See page 14).

Throat plate incorrectly seated.

Excessive end play in horizontal arm shaft. (See page 13.)

Feed dog striking slots in throat plate. (See page 7).

Excessive end play in feed shafts. (See page 14.)

**WHEN THREAD SNAGGING, SKIPPED STITCHES
OR OTHER THREAD HANDLING DIFFICULTIES
OCCUR**

CHECK:

Position of hook to or from needle. (See page 10.)

Correct pressure and tension settings. (See pages 6, 11 and 12.)

Needle bar height. (See page 9.)

Hook timing. (See page 10.)

WHEN MACHINE RUNS SLUGGISH

CHECK:

Machine may need cleaning and lubricating.

Horizontal arm shaft or hook shaft binding. (See pages 13 and 14.)

Binding in other points.

WHEN NEEDLE STRIKES PRESSER FOOT

CHECK:

Needle bar height. (See page 9.)

Correct seating of needle in needle bar.

Correct seating of presser foot on presser bar.

Presser bar height. (See page 6.)

Bent needle.

WHEN NEEDLE STRIKES SEWING HOOK

CHECK:

Correct seating of needle in needle bar.

Bent needle or needle bar.

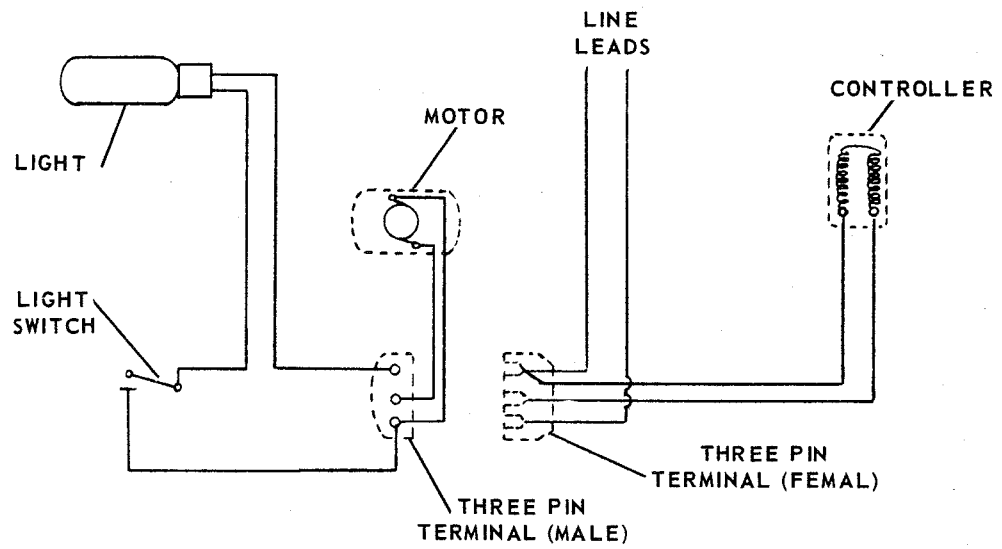
Hook timing. (See page 10.)

Loose needle clamping screw.

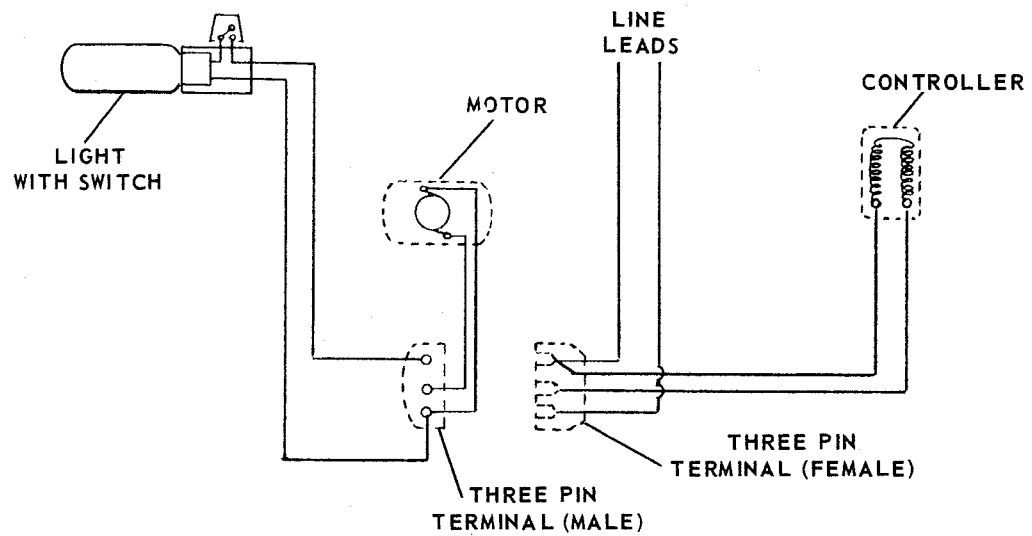
Excessive end play in hook driving shaft. (See page 14.)

WIRING DIAGRAMS

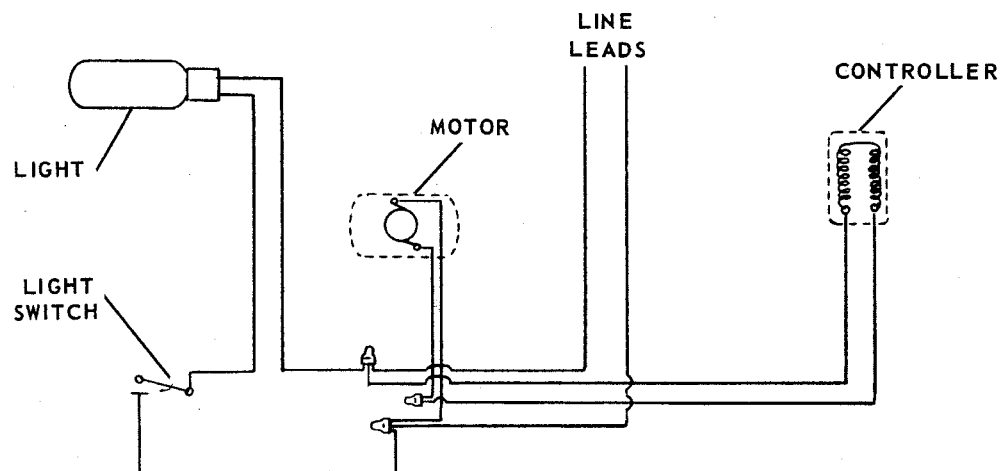
MACHINES 221-1 AND 221K5



MACHINE 221K4

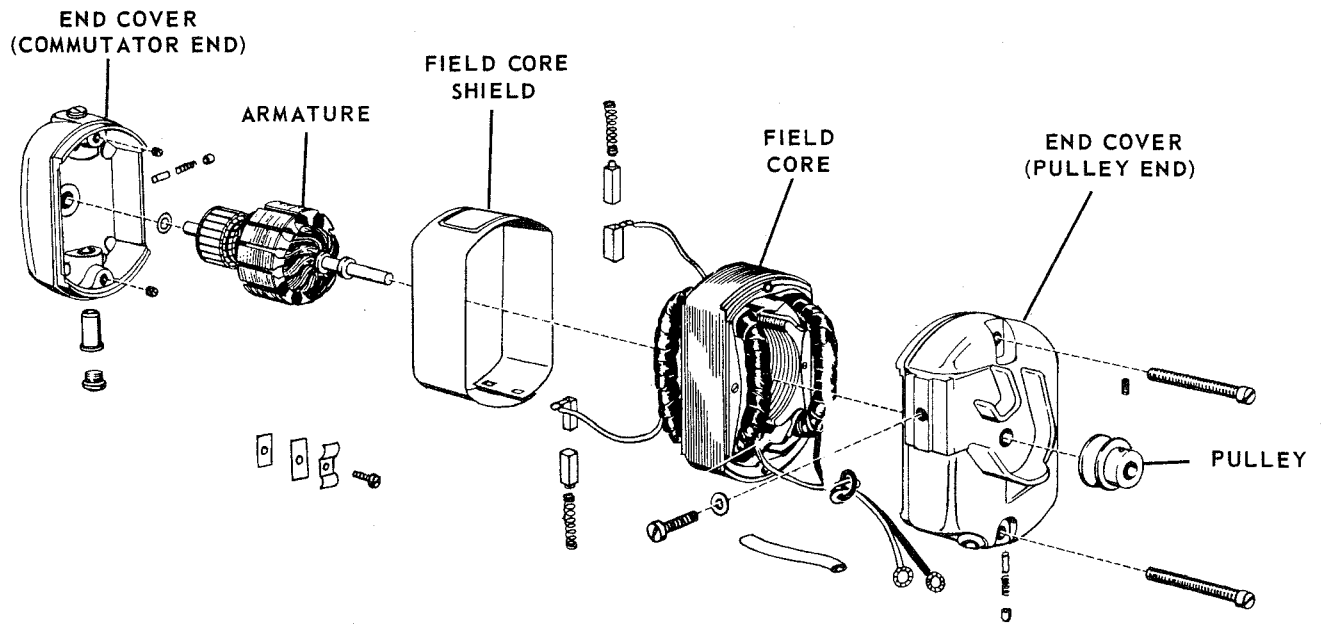


MACHINE 221K7

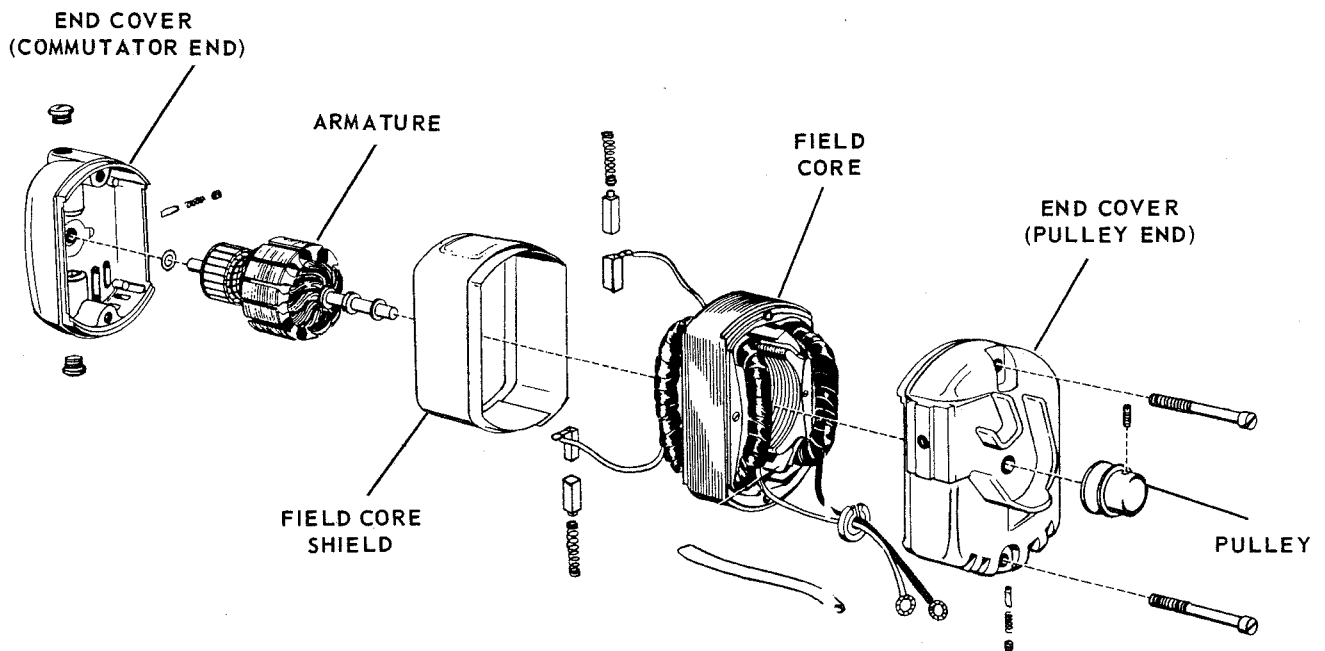


MOTORS

SERIES 3 MOTOR

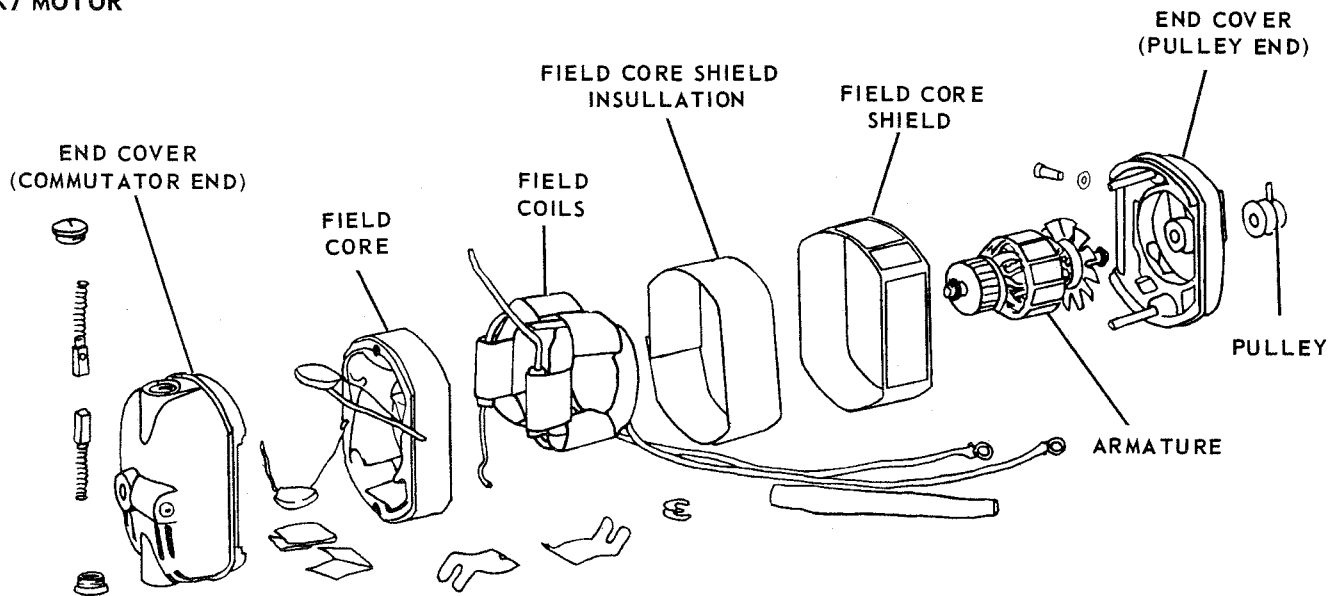


CAJ6-8 MOTOR

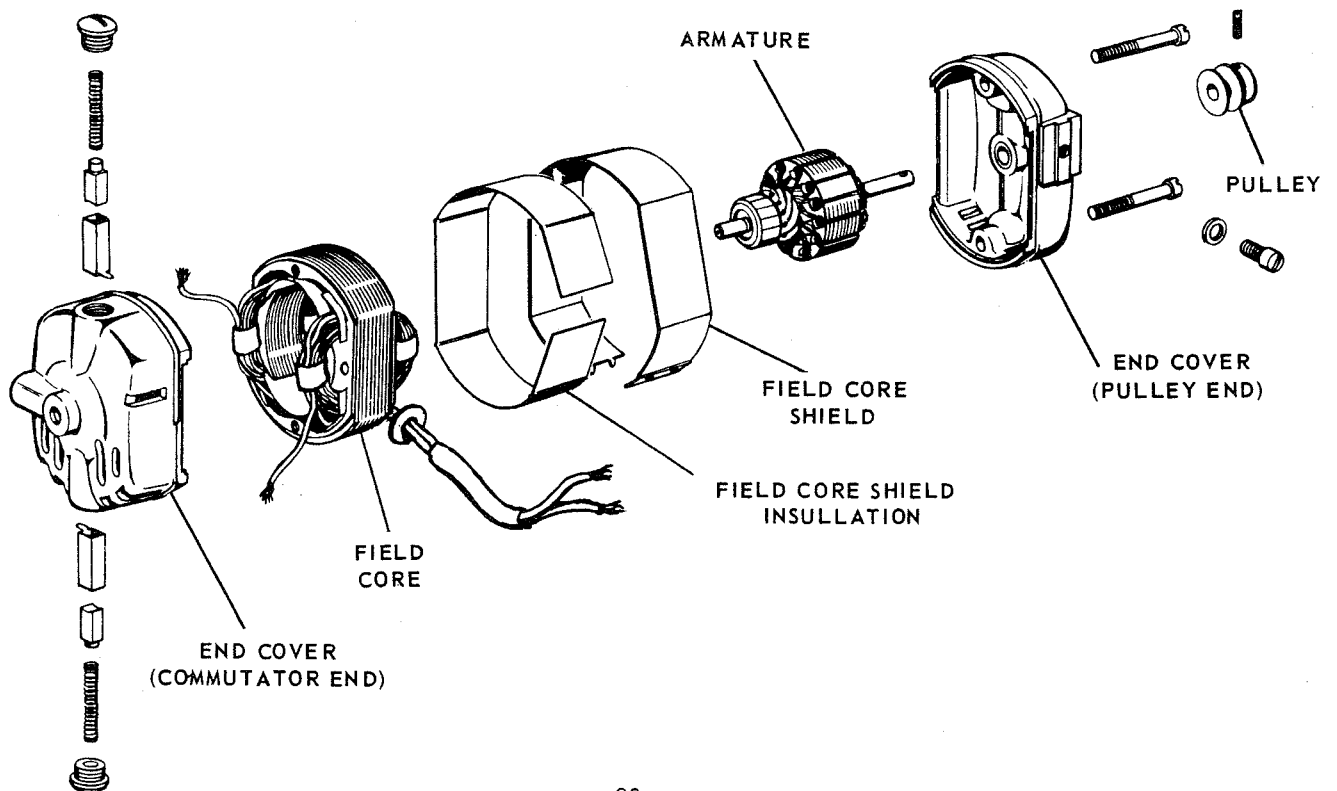


MOTORS (Continued)

CAK7 MOTOR



CAK8-8 MOTOR



INDEX

Adjustments

Arm shaft, horizontal.....	13	Lubrication, machine.....	4
Upright.....	13	Motor.....	5
Description.....	3	Needle bar bushing.....	9
Feed dog, height.....	6	Height.....	9
In relation to throat plate.....	7	Presser foot, height.....	6
Feed rock shafts.....	14	Pressure, bobbin winder.....	12
Hints, for adjusters.....	26	Principal parts.....	3
Hook, in relation to needle.....	10	Take-up spring, stroke.....	11
Timing.....	10	Pressure.....	11
Hook shaft.....	14	Tension, bobbin thread.....	12
Inspection.....	4	Needle thread.....	11

Removals and Replacements

Arm shaft, connection belt.....	24	Hand wheel.....	23
Horizontal.....	24	Hook, rotating.....	19
Upright.....	23	Hook shaft (gear driven).....	19
Bobbin case base.....	18	Hook shaft (belt driven).....	20
Feed forked connection.....	22	Motor.....	25
Feed lifting rock shaft.....	21	Needle bar.....	15
Connecting rod.....	22	Needle thread take-up.....	16
Feed regulator.....	20	Needle thread tension.....	16
Feed rock shaft.....	21	Presser bar.....	15